

BIG IDEA

Infinite Platforms Power Enterprise Acceleration

Customers Seek Consistent Cross-Cloud Compute
Continuums for Next-Gen Apps



Holger Mueller
Vice President and Principal Analyst

Copy Editor: Jim Donahue

Layout Editor: Aubrey Coggins

TABLE OF CONTENTS

Executive Summary..... 3

The Era of Infinite Computing Is Upon Us 4

The Enterprise Acceleration Challenge..... 8

Infinite Platforms Begin with the Cloud13

Styles of Cloud and Workload Portability Play a Key Role in the Transition to Infinite Computing16

Recommendations18

Related Research20

Endnotes22

Analyst Bio23





About Constellation Research.....24



EXECUTIVE SUMMARY

Enterprises are being challenged by Enterprise Acceleration¹ and require a new breed of platforms that can expand across all currently available and future computing platforms. Faced with business process uncertainty in the age of Infinite Computing, enterprises need workload portability and a single pane of glass to run and manage the workloads for their next-generation applications across an Infinite Platform architecture.

Business Themes

-  New C-Suite
-  Data to Decisions
-  Digital Safety and Privacy
-  Technology Optimization

THE ERA OF INFINITE COMPUTING IS UPON US

Historically, tools available to mankind were finite—limited in quantity. If you had to hammer more, you brought in more hammers and more people who could hammer. Until the 1990s, the same applied to traditional enterprise IT: Systems had to be sized to the task, networks procured by volume and storage capacity planned sufficiently to cope with storage volume. Mistakes were costly and had the “employee experience” concept been around already, CxOs would have known that mistakes in sizing either lead to bad customer experience and employee experience (a system sized too small) or to financial inefficiencies (a system sized too big).

Constellation sees a new era upon us with five key shifts to infinite possibilities:

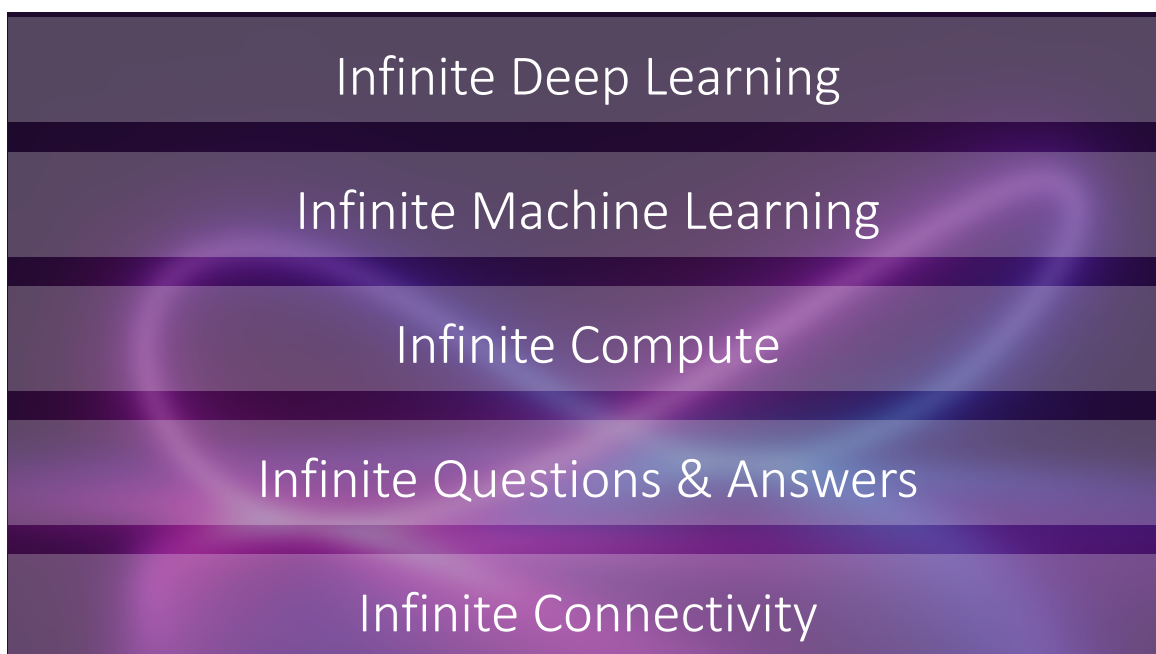
1. Infinite Connectivity Is the Foundation That Powers Everything

Today we take the internet revolution of the 1990s for granted. It fueled the growth rate of the '90s. That telco providers and enterprises would spend the capex to provide “free” servers, networking connections and bandwidth was revolutionary. This was something new for enterprises, where investments were always limited to the perimeter.

Today, enterprises can safely operate knowing that every phone number, email address and web address can be reached by almost everyone worldwide. Consumers experience Infinite Connectivity with flat-rate internet access. This is true for mobile users for most practical purposes, as well. Only enterprises still have to somewhat size the pipe they want to use and pay based on volume.

Infinite Connectivity (see Figure 1) has enabled and disrupted numerous business models, from retail to transportation. With effectively 5.1 billion unique mobile subscribers,² consumers have access to Infinite Connectivity and enterprises can reach everybody who is connected. And with efforts underway to connect remaining individuals who are still not online, Infinite Connectivity will be a given for mankind's technology future.

Figure 1. Infinite Computing Layers



Source: Constellation Research

2. Infinite Questions and Answers Revolutionize Insight to Action

Enterprises need insights so they can monitor and analyze their performance. The traditional solutions have been reporting and, for more-complex questions, data warehouses. But such systems were able to give answers only to the questions that they were built or set up to handle. New questions and new data sources always required new work by vendors, consultants and/or IT. The result was always a delay for getting answers. In many cases, CxOs had even given up asking new questions because the ability to answer them would be dangerously slow and prohibitively expensive.

With the invention of Hadoop and the rise of Hadoop-enabled platforms, these problems have been overcome from a technology perspective, and Hadoop has become a widespread business reality. Though the technology has a bad reputation partially due to challenges and complexity in setup and maintenance, it is quickly replacing the traditional data warehouse. That's because Hadoop technology does more than allow enterprises to store all electronic information available, both digital artifacts and digital exhaust, at low cost. More importantly, it allows users to query that data for any kind of question via a standard SQL command.

Hadoop overcomes the limited ability to ask questions and add additional data, effectively creating the ability of Infinite Questions and Answers. Practically, there is no commercial and technical limit on how much data enterprises want to put into Hadoop clusters, and there is no practical limit at the number and depth of the questions that can be asked. For the first time in mankind's history, leaders can get all information into a single place, and then ask questions to obtain crucial insights—without knowing the questions beforehand.

3. Infinite Compute from the Cloud Enables New Best Practices

In the old world of limited IT resources, it was crucial to appropriately size machines. The most expensive component of a server is its CPU power, so enterprises used extra caution to make sure their servers were not oversized. Nonetheless, the average load on enterprise servers (and desktops/laptops as well) is in the 10% to 20% range.

With the rise of the public cloud, and CPUs remaining the most expensive component of a server, idling north of 80% is very expensive for the public cloud and infrastructure-as-a-service (IaaS) providers. Consequently, IaaS providers have found ways to run more loads and achieve much better utilization of their servers, using virtualization and hypervisors.

The benefit for enterprises is that the compute cost has not only fallen substantially thanks to the public cloud data model, enterprises also have been freed from the traditional sizing challenge for the servers that powered their computational workloads. This is how compute, for all practical purpose, became infinite. Today, CxOs no longer worry about compute sizing when their next-generation applications require more compute capacity. And IaaS vendors promote compute utilization with spot rates and campaigns when they're running high on compute capacity.

4. Infinite Machine Learning Redefines Enterprise Software

With the ability of Infinite Connectivity, Infinite Questions and Answers and Infinite Compute, enterprises have all three key ingredients to enable the next phase that revolutionizes enterprise software: Infinite Machine Learning.

Machine learning (some call it artificial intelligence, or AI) needs data to be able to use sophisticated mathematical and statistical algorithms to power next-generation applications. Infinite Connectivity means that all relevant data can be provided, often in real time to where machine learning needs to happen. Hadoop allows the infinite storage and query capability of the data. And cheap Infinite Compute allows the running of multiple and complex machine learning models to automate the insights, decisions and actions that enterprises need.

This brings the days of limited, finite data science to an end. Traditionally, data scientists have had to size the machines to the problem they wanted to answer. They often had to compromise on the use of live data, as it was often shipped to them by mail on tape. They usually had to make brave assumptions to sample data because their machines had caps for limited storage and compute. And then they had to make even braver assumptions on the analytical models to be applied, due to limited compute capacity. All this is history now because all critical elements of operating data science have reached “infinity,” de facto enabling Infinite Machine Learning.

5. Infinite Deep Learning Leads to 21st Century Automation

When software can run machine learning unsupervised, it is called deep learning. CxOs know that when they have reached Infinite Machine Learning, applying Infinite Compute and Infinite Questions and Answers, it is only a small step to Infinite Deep Learning.

The step, while small on the technology side, has a massive impact on the business side. Effectively, Infinite Deep Learning unshackles enterprises from their dependence on data scientists and other experts that powered their insights and automation. Thanks to the ability of Hadoop to add and query additional data sources without much effort, and thanks to the cheap compute from the cloud, enabled by Infinite Machine Learning, enterprises can now experience Infinite Deep Learning.

When enterprises manage to power the necessary analytical, insight and automation needs of their next-generation applications, they reach a completely different enterprise software reality: Not only does all of the infrastructure run on operational expenses (opex), it can also be tied to the business need for scaling up and down, thus controlling the cost of running software automation. But the biggest benefit is closing the insight-to-action loop, taking slow reactions times, human delays, processing errors and

oversight out of the equation of business success. Enterprises that are able to tap into these capabilities earlier will completely disrupt and *travolge*³ their industries. Infinite Deep Learning redefines the “hand-to-machine ratio” (the level of automation that replaces manual work) in enterprises to a total new level of automation.

THE ENTERPRISE ACCELERATION CHALLENGE

Financial Markets Show Evidence of Enterprise Acceleration

Stock market indexes are great indicators for the volatility and dynamics in an economy. Consider some of the following metrics:

- **Fifty-two percent of companies on the Fortune 500 list in 2000 have left the list.** Mergers and acquisitions have been only one factor; not growing fast enough was the main reason for falling off this index.
- **DAX sees 100%+ turnover in 30 years.** The Frankfurt-based DAX index has seen 32 members leave since its start in December 1987. That is more than a 100% turnover rate. Apart from acquisitions and mergers, the No. 1 reason why enterprises fell out of the DAX index has been insufficient market capitalization. This boils down to the inability of an enterprise to maintain or grow its stock price valuation, combined with a lack of confidence on the part of investors.
- **FTSE loses 264 members since inception.** More than 260 enterprises have fallen out of the 100-member FTSE index since its start in January 1984. That works out to nearly two enterprises exiting the FTSE per calendar quarter. Lack of market capitalization followed by acquisitions and mergers are the main reasons for the substantial turnover in the list, which includes the top 100 U.K. companies based on market capitalization.
- **S&P sees average age of new members drop to 10 years.** Another U.S. index, the S&P 500, has seen a dramatic reduction in the average age of a company joining it. Back in 1957, the average age of a new S&P 500 member was 75 years, or three-quarters of a

century. In 2003, 46 years later, the average age of a joining company had fallen to 25 years. Fast forward another 10 years, and the mark stood at 10 years (see Figure 2).

The Dow has also seen dramatic departures. No less than General Electric, which had been a founding member of the index since 1907, fell on June 19, 2018. GE's fate was foretold in 2014, when it became the least valuable stock in the index for the first time. Still, the fact that such a venerable enterprise can fall out from the Dow in less than five years is another indication that the speed of an enterprise and its ability to accelerate have become key survival factors in the 21st century.

An Aging World Population Creates Urgency

Over the next 15 years, the number of older persons is expected to grow fastest in Latin America and the Caribbean, with a projected 71% increase in the population age 60 or over, followed by Asia (66%), Africa (64%), Oceania (47%), Northern America (41%) and Europe (23%), according to the United Nations.

Figure 2. Enterprises Joining the S&P 500 Are Getting Younger and Younger



Source: Constellation Research

By 2030, older persons are expected to account for more than 25% of the populations in Europe and in Northern America; 20% in Oceania; 17% in Asia, Latin America and the Caribbean; and 6% in Africa.

In 2050, 44% of the world's population will live in relatively aged countries, with at least 20% of the population age 60 or over, and one in four people will live in a country where more than 30% of people are above age 60.⁴

The consequences for enterprises are twofold. First, it will get increasingly hard to find the talent and people to fuel a transformation. It also means that enterprises have to dramatically change their “hand-to-machine” ratio.

The Legislative Tsunami Becomes More Challenging

Given the unfavorable aging dynamics, legislative bodies all over the world have to ramp up the regulatory engine. Governments need to find ways to fund the needs of an aging population both from income and healthcare perspectives. The only redistribution can come from the income earners of an economy: people and enterprises. The regulation needed for that will have to be understood, implemented and practiced in enterprises. Faced with these challenges, enterprises increasingly will look for vendors and service providers to help them.

A new software/service category, compliance as a service (CaaS), is likely to emerge. CaaS vendors will present themselves to enterprises as the in-and-out box of all statutory work, at local, regional and state, and national and international levels. But this will require a combination of software and services that has yet to coalesce, leaving enterprises with the chore of figuring out statutory change implications on their own for the immediate future.

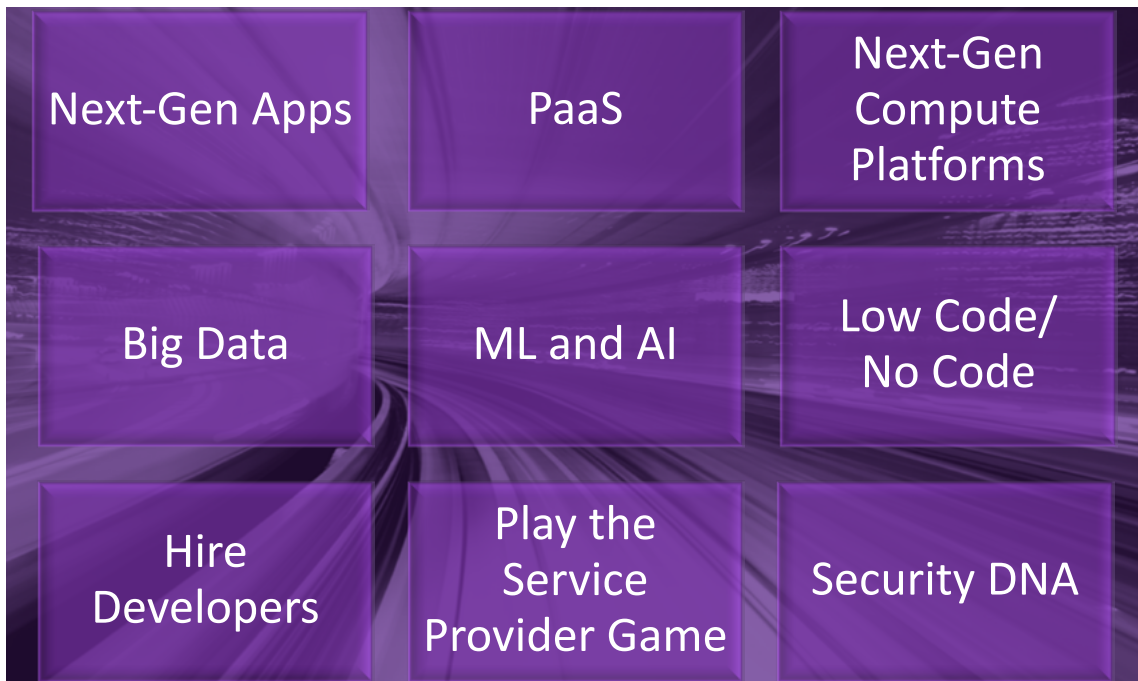
In the meantime, technology leaders have to stay on top of the legislative changes. Enterprises struggle with the fallout of General Data Protection Regulation (GDPR) implemented in the EU, California has passed the California Consumer Privacy Act and so on.

The Nine Drivers for Enterprise Acceleration in IT

Nine crucial components play a significant role in enterprise IT acceleration (see Figure 3).

- **Next-gen apps enable business agility.** The combination of all three drivers fueling the era of Infinite Computing are changing enterprise automation forever. Forward-looking technology leaders realize that and have chosen platform-as-a-service (PaaS) options that allow them to build next-generation applications.
- **PaaS is the enterprise steam engine of the 21st century.** Similar to how the steam engine started the Industrial Revolution in the 18th century, PaaS platforms are driving transformation in the 21st century. As all enterprises become software companies, the tools that enable them to get there are as essential as the steam engine was to increase industrial output beyond what was possible with manual labor.

Figure 3. The Nine Drivers for Enterprise Acceleration in IT



Source: Constellation Research

- **Next-gen computing platforms are mandatory.** The big revelation of 2018 was that public cloud vendors discovered the value of on-premises deployments. For the longest time, IaaS vendors saw on-premises computing workloads as a migration opportunity to the public cloud. But the need for enterprises to operate computing locally due to statutory, regulatory, performance and load-specific reasons has not gone away.
- **Big data fuels data to decisions.** If PaaS is the steam engine of the 21st century, then big data is the fuel tank of the accelerated enterprise. The good news is that recently there has been substantial innovation, particularly by cloud vendors, to make big data easier to consume, even at a business-user level.
- **Machine learning and AI deliver exponential gains.** Similar to how the automated shop floor became a must-have for any enterprise in the business of building repetitive products, machine learning and deep-learning networks will become crucial technologies for enterprises. The advantages of being able to extract the know-how of workers from their digital exhaust are too compelling to not leverage the technology that enables this. Therefore, the mastering of machine learning becomes a survival technology for enterprises. Enterprises operating successfully on deep-learning networks will be able to move faster and react quicker than their competitors that still operate traditionally.
- **Low code/no code enables rapid creation and consumption.** We all know fast food is not good for us... but we keep eating it. However, when the situation warrants, fast food may be the best way to eat a quick meal. Now, transfer the hunger for calories to the hunger for software. Technology leaders must be able to serve their enterprise software—a lot of software, and fast. And as we already have realized that every enterprise is becoming a software company, the ability to create a lot of software fast is key for enterprise success—even survival.
- **Hire developers to make sure your software eats the world.** Hiring developers may seem like a no-brainer for all technical leaders who want to help their enterprise accelerate. But adding a new worker function and sourcing new talent pools is never

trivial. Then there's the image issue and the key concerns of any talented developer:
Why should I work for that company?

Hiring a successful developer team requires more than attractive work conditions. It also needs a complete rebranding of the enterprise toward the developer talent pool, and authenticity is crucial. With a talent pool as well-connected and fickle as developers, not living up to the brand and related values will be a nonstarter.

- **Masterfully play the service provider game.** Enterprises have not been able to solve all their talent and services needs in-house and traditionally have relied on external consultants to help them achieve goals. Enterprise Acceleration is no different. Consequently, technology leaders must exhibit caution when engaging with consultants on the strategic subject of Enterprise Acceleration.
- **Security should not be an afterthought.** When enterprises become more digital, they reap benefits but are also exposed to risks. And often these risks are overlooked, neglected and uncovered too late. The technology leaders in charge of Enterprise Acceleration projects need a different approach. Just as it is not safe to drive without a seat belt, an Enterprise Acceleration project is not safe without built-in security. The alternative can be disastrous. As digital tools become more powerful, that power can be creative or destructive.

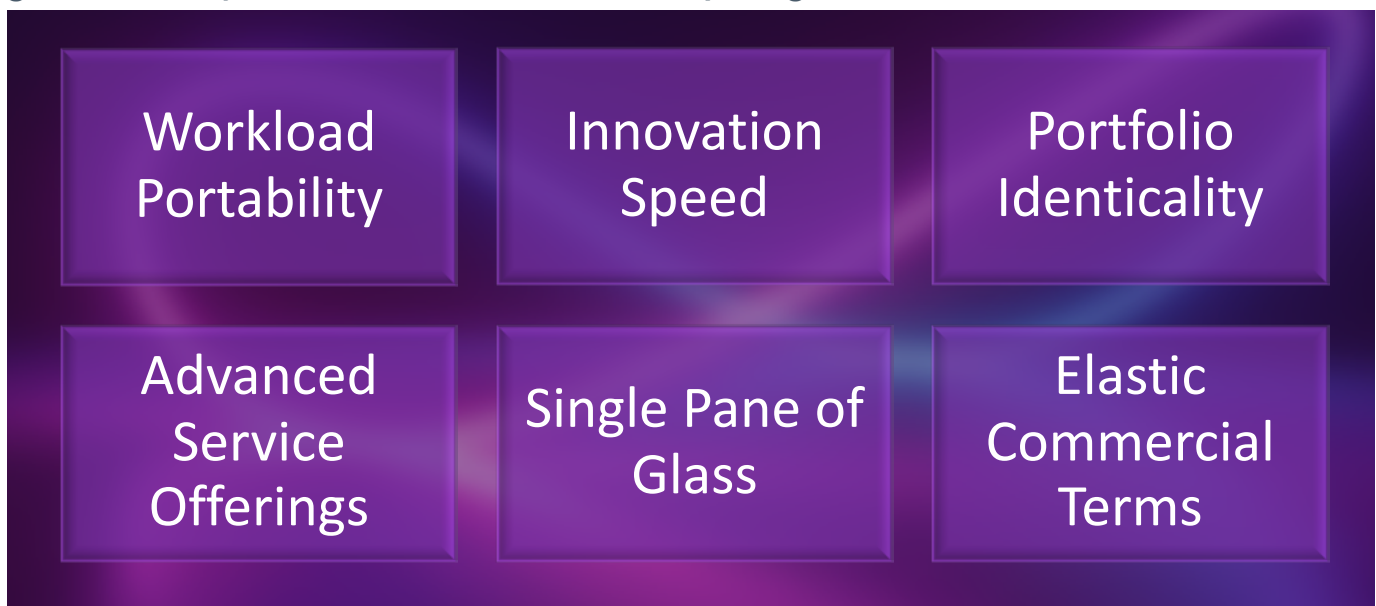
INFINITE PLATFORMS BEGIN WITH THE CLOUD

In order to achieve Infinite Platforms, enterprises need to successfully navigate the market trends for next-generation computing platforms, characterized by the following six buyer criteria (see Figure 4):

Workload Portability

In uncertain times like ours, investment protection is paramount for CxOs. This means that operational next-generation application assets should be able to run both in the public cloud and on-premises. Legislative, data residency, privacy and performance concerns are the main drivers behind this

Figure 4. Six Buyer Criteria for an Infinite Computing Platform



Source: Constellation Research

capability, apart from better resource utilization and flexibility. Vendors with a broader overlap of cloud and on-premises capabilities generally do better for this selection criterion.

Innovation Speed

Platforms cannot stand still, and as such need to add new capabilities at a high rate. CxOs expect that capabilities will be available at the same time for both cloud and on-premises platforms, so that their application loads do not get shackled to one form of deployment. On the other hand, CxOs realize that much of the desired capabilities for next-generation applications have been developed in the cloud and may only gradually become available on-premises. Some capabilities are not commercially viable or desirable to be available on-premises.

Portfolio Identicality

Beyond workload portability, CxOs expect that the functional portfolios offered in the cloud and on-premises are as identical as possible. This is a critical selection criterion, as rapidly expanding next-generation application portfolios quickly consume additional services and with that, may become

dependent on a cloud-only deployment. CxOs do not want that form of lock-in and therefore want to see the same capabilities, with seamless usage, work across the cloud and on-premises.

Advanced Service Offerings

In the cloud, vendors have been able to scale far beyond what is possible for any CxO with an on-premises deployment. When running the workloads of thousands of customers, vendors can scale much better than single IT organizations. And the sort of scale IaaS vendors can reach doesn't even consider the skills challenge caused by the complex nature of cloud platform technology stacks, if enterprises want to run these stacks in-house. Therefore, CxOs want vendors to offer them remote management capabilities, while they are only responsible for physical security, networking and power.

Single Pane of Glass

Managing workloads is complex, and as enterprises have only limited resources available, CxOs require a single pane of glass to manage workloads in a next-generation computing platform. This is a win/win for enterprises and vendors, as enterprises would like to see the integration of all compute resources in a single operational console, and vendors can charge a premium for the additional capabilities while gaining transparency into workload profiles and ensuring customer success.

Elastic Commercial Terms

As mentioned earlier, there is a disconnect between technological capability and commercial reality. Vendors try to lock enterprises into long-term contracts, which in most cases are not in a customer's best interest. CxOs need to negotiate smartly to avoid overly lengthy contract terms that cement their procured computing capacity into a too-rigid format because it is clear that the future will need even more rapidly shifting computing demands.

STYLES OF CLOUD AND WORKLOAD PORTABILITY PLAY A KEY ROLE IN THE TRANSITION TO INFINITE COMPUTING

Platforms that fulfill these buyer criteria give enterprises facing the disruptive challenges what they need most – workload portability across the different computing platforms offered today (see Figure 5):

- **On-premises.** Enterprises still need to be able to operate their next-generation application on-premises. The most prominent drivers are data residency requirements, performance requirements and a lack of local public cloud data centers, often all coupled with a substantial dose of public cloud skepticism.
- **Private cloud.** When operating workloads on-premises, it's wise for enterprises to be able to use some of the cloud's benefits, most notably elasticity. Being able to scale workloads on demand using cloud technologies in an elastic way is the reason for operating private clouds.
- **Hybrid cloud.** A combination between on-premises/private cloud and public cloud creates the hybrid cloud operational scenario, which is the reality for most enterprises today.

Figure 5. Cross-Platform Workload Portability Defines Infinite Platforms



Source: Constellation Research

- **Public cloud.** The public cloud with its “pure” cloud characteristics, most prominently elasticity, is a key operational platform, especially for new workloads coming from next-generation applications.
- **Multicloud.** Automation split across multiple public clouds creates the multicloud scenario that most enterprises find themselves in, mostly due to SaaS vendors’ public cloud choices.

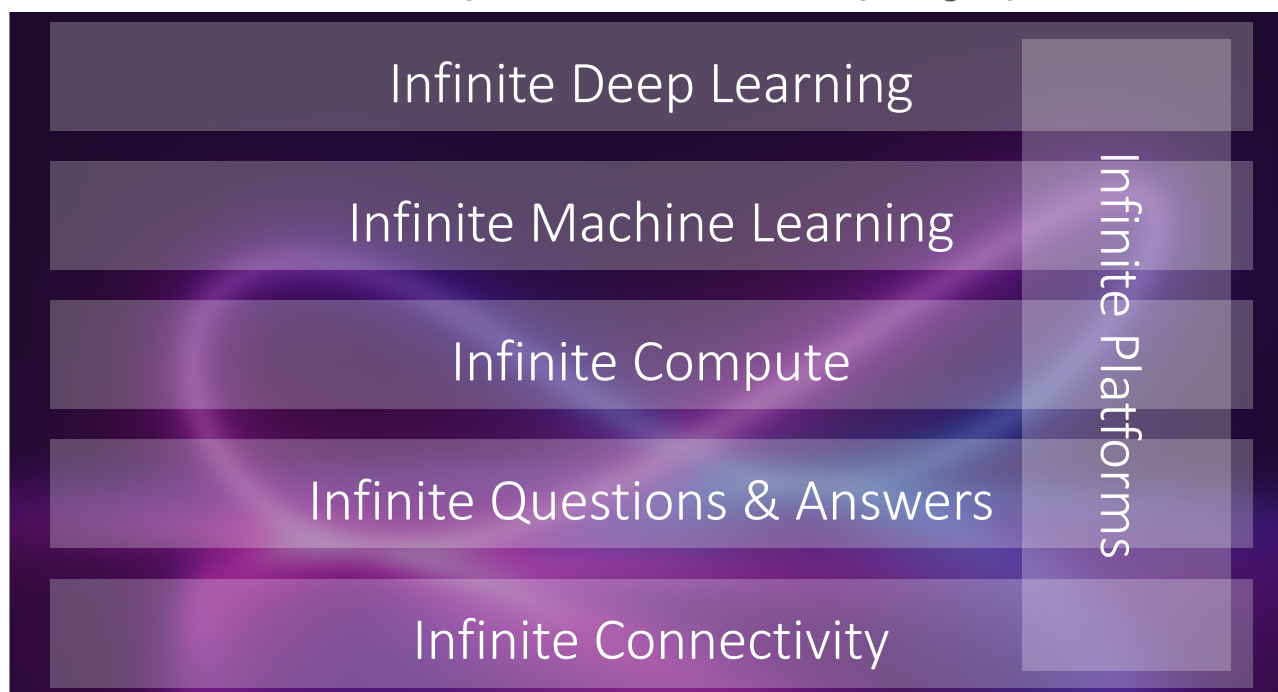
Useful workload portability is largely determined by the identity that an Infinite Platform vendor can provide. The more identical the platform is between the five different computing use cases, the more likely an enterprise will be to move its workloads across them. Not requiring code changes, test efforts and validation efforts is key for enterprises to move faster, effectively achieving Enterprise Acceleration.

Once workload portability is secured, enterprises want to make sure that they can manage these workloads with a single control plane. This guarantees high operational efficiencies both from a training and a maintenance perspective of workloads. Lastly, enterprises need Infinite Platforms to be elastic, which is to gracefully scale up and down depending on the workload’s usage of compute resources. When public clouds are involved, elasticity extends to the commercial terms of the workload as well. Enterprises do not want to pay for compute resources they do not utilize.

Finally, Infinite Platforms need to be able to span across all five layers that define the era of Infinite Computing (see Figure 6).

Providers of Infinite Platforms may not span all five layers currently. They may partner or build the additional capabilities to span additional layers.

Figure 6. How Infinite Platforms Span the Five Infinite Computing Layers



Source: Constellation Research

RECOMMENDATIONS

It's time for CxOs to look for vendors that can give them Infinite Compute platforms that span across the multiple deployment options, allow their enterprises to take advantage of the technologies that define the era of Infinite Computing, allow them to power their next-generation applications and allow them to achieve Enterprise Acceleration.

Here are some key recommendations on how to get there:

- **Determine enterprise priorities.** It is more important than ever to determine an enterprise's priorities. The decisions derived from these priorities will determine not only the success but even the survival of the enterprise in the era of digital disruption, fueled by Infinite Computing.
- **Chart your next-generation application strategy.** As standard software vendors suffer in the current era of business best-practice process uncertainty, enterprises need to

pick their strategy on where and how many next-generation applications they need to build not only to survive, but thrive.

- **Implement Enterprise Acceleration.** Regardless of plans on Infinite Computing platforms and next-generation applications, CxOs need to prepare their enterprises to move faster and accelerate. This will pay off one way or the other, as one thing is sure—business will be faster and more demanding tomorrow.
- **Look for vendors.** Infinite Computing platforms exist already today, so CxOs need to look for vendors that can enable workload portability, by creating high identity across the desired and required computing platforms. CxOs need to talk to these vendors early and often and should consider at least piloting their capabilities.
- **Practice commercial prudence.** No matter the vendor, enterprises must always make sure that they obtain the value they seek—including from Infinite Computing platforms.

RELATED RESEARCH

For the Market Overview, see: Holger Mueller, “Next-Gen Computing: The Enterprise Computing Model for the 2020s,” Constellation Research, September 14, 2018. <https://www.constellationr.com/research/next-gen-computing-enterprise-computing-model-2020s>

For a Constellation ShortList™ on IaaS vendors, see: Holger Mueller, “Constellation ShortList Global IaaS for Next-Gen Applications,” Constellation Research, February 20, 2018. <https://www.constellationr.com/research/constellation-shortlist-global-iaas-next-gen-applications-2>

For more details on Infinite Computing, see Holger Mueller, “The Era of Infinite Computing Triggers Next-Generation Applications,” June 1, 2018. <https://www.constellationr.com/research/era-infinite-computing-triggers-next-generation-applications>

For the people-leader perspective on the skills shortage and the need for Enterprise Acceleration, see: Holger Mueller, “Why People Leaders Must Embrace Enterprise Acceleration,” Constellation Research, July 3, 2018. <https://www.constellationr.com/research/why-people-leaders-must-embrace-enterprise-acceleration>

For the IT perspective on Enterprise Acceleration, see: Holger Mueller, “Why the C-Suite Must Embrace Enterprise Acceleration,” May 2, 2019. <https://www.constellationr.com/research/why-c-suite-must-embrace-enterprise-acceleration>

For the success of open source, see: Holger Mueller, “How Open Source Won and Will Keep Winning,” August 20, 2019. <https://www.constellationr.com/research/how-open-source-won-and-will-keep-winning>

For more on the future of code automation, see: Holger Mueller, “The Future of DevOps Is Automated Software Operations,” June 21, 2019. <https://www.constellationr.com/research/future-devops-automated-software-operations>

For more best-practice considerations for PaaS offerings, see: Holger Mueller, “As PaaS Turns Strategic, So Do Implementation Considerations,” Constellation Research, May 9, 2018. <https://www.constellationr.com/research/paas-turns-strategic-so-do-implementation-considerations>

For more on next-gen applications and PaaS offerings, see: Holger Mueller, “Why Next-Gen Apps Start with a Next-Gen Platform as a Service,” April 5, 2018. <https://www.constellationr.com/research/why-next-gen-apps-start-next-gen-platform-service>

For a Constellation ShortList on PaaS vendors, see: Holger Mueller, “Constellation ShortList PaaS Tool Suites for Next-Gen Apps,” Constellation Research, February 13, 2018. <https://www.constellationr.com/research/constellation-shortlist-paas-tool-suites-next-gen-apps-1>

RELATED RESEARCH CONTINUED

Also: Holger Mueller, "Constellation ShortList PaaS Suites for Next-Gen Apps," February 27, 2018. <https://www.constellationr.com/research/constellation-shortlist-paas-suites-next-gen-apps-1>

For additional IaaS and PaaS selection criteria, see: R "Ray" Wang and Holger Mueller, "Key Questions for Every Public Cloud IaaS/PaaS Decision Matrix," Constellation Research, January 24, 2018. <https://www.constellationr.com/research/key-questions-every-public-cloud-iaaspaas-decision-matrix>

For next-generation databases, see: Holger Mueller, "Constellation ShortList Next-Gen Databases - RDBMS for On-Premises," Constellation Research, February 27, 2019. <https://www.constellationr.com/research/constellation-shortlist-next-gen-databases-rdbms-premises-1>

For an example of digital transformation, see: Holger Mueller, "Lufthansa Digitally Transforms the Workplace for Flight Managers," Constellation Research, February 27, 2018. <https://www.constellationr.com/research/lufthansa-digitally-transforms-workplace-flight-managers>

ENDNOTES

¹ Enterprise Acceleration is a set of strategies that apply to both software and infrastructure as well as people—and help an enterprise to move faster and become more agile. For the IT perspective on Enterprise Acceleration, see: Holger Mueller, “Why the C-Suite Must Embrace Enterprise Acceleration,” May 2, 2019. <https://www.constellationr.com/research/why-c-suite-must-embrace-enterprise-acceleration>

² Source: <https://www.gsma.com/>

³ This is the author’s signature verb, anglicized from the Italian “travolgere,” as the English language does not have a corresponding word. It means the active/passive change of something at a pace faster than organic but slower than disruptive.

⁴ For the statistics and more, refer to United Nations, “World Population Prospects 2017.” <https://www.un.org/en/development/desa/population/publications/index.asp>

ANALYST BIO

Holger Mueller

Vice President and Principal Analyst

Holger Mueller is vice president and principal analyst at Constellation Research, providing guidance for the fundamental enablers of the cloud, IaaS, PaaS, with forays up the tech stack into big data, analytics and SaaS. Holger provides strategy and counsel to key clients, including chief information officers (CIO), chief technology officers (CTO), chief product officers (CPO), investment analysts, venture capitalists, sell-side firms and technology buyers.

Prior to joining Constellation Research, Holger was VP of products for *NorthgateArinso*, a KKR company. He led the transformation of products to the cloud and laid the foundation for new business-process-as-a-service (BPaaS) capabilities. Previously, he was the chief application architect with *SAP* and was also VP of products for *FICO*. Before that, he worked for *Oracle* in various management functions—both on the application development (CRM, Fusion) and business development sides. Holger started his career with *Kiefer & Veitinger*, which he helped grow from a startup to Europe's largest CRM vendor from 1995 onwards. Holger has a Diplom Kaufmann from University of Mannheim, with a focus on Information Science, Marketing, International Management and Chemical Technology. As a native European, Mueller speaks six languages.

 [@holgermu](https://twitter.com/holgermu)  constellationr.com/users/holger-mueller  linkedin.com/in/holgermueller

ABOUT CONSTELLATION RESEARCH

Constellation Research is an award-winning, Silicon Valley-based research and advisory firm that helps organizations navigate the challenges of digital disruption through business models transformation and the judicious application of disruptive technologies. Unlike the legacy analyst firms, Constellation Research is disrupting how research is accessed, what topics are covered and how clients can partner with a research firm to achieve success. Over 350 clients have joined from an ecosystem of buyers, partners, solution providers, C-suite, boards of directors and vendor clients. Our mission is to identify, validate and share insights with our clients.

Organizational Highlights

- Named Institute of Industry Analyst Relations (IIAR) New Analyst Firm of the Year in 2011 and #1 Independent Analyst Firm for 2014 and 2015.
- Experienced research team with an average of 25 years of practitioner, management and industry experience.
- Organizers of the Constellation Connected Enterprise—an innovation summit and best practices knowledge-sharing retreat for business leaders.
- Founders of Constellation Executive Network, a membership organization for digital leaders seeking to learn from market leaders and fast followers.

 www.ConstellationR.com

 [@ConstellationR](https://twitter.com/ConstellationR)

 info@ConstellationR.com

 sales@ConstellationR.com

Unauthorized reproduction or distribution in whole or in part in any form, including photocopying, faxing, image scanning, e-mailing, digitization, or making available for electronic downloading is prohibited without written permission from Constellation Research, Inc. Prior to photocopying, scanning, and digitizing items for internal or personal use, please contact Constellation Research, Inc. All trade names, trademarks, or registered trademarks are trade names, trademarks, or registered trademarks of their respective owners.

Information contained in this publication has been compiled from sources believed to be reliable, but the accuracy of this information is not guaranteed. Constellation Research, Inc. disclaims all warranties and conditions with regard to the content, express or implied, including warranties of merchantability and fitness for a particular purpose, nor assumes any legal liability for the accuracy, completeness, or usefulness of any information contained herein. Any reference to a commercial product, process, or service does not imply or constitute an endorsement of the same by Constellation Research, Inc.

This publication is designed to provide accurate and authoritative information in regard to the subject matter covered. It is sold or distributed with the understanding that Constellation Research, Inc. is not engaged in rendering legal, accounting, or other professional service. If legal advice or other expert assistance is required, the services of a competent professional person should be sought. Constellation Research, Inc. assumes no liability for how this information is used or applied nor makes any express warranties on outcomes. (Modified from the Declaration of Principles jointly adopted by the American Bar Association and a Committee of Publishers and Associations.)

Your trust is important to us, and as such, we believe in being open and transparent about our financial relationships. With our clients' permission, we publish their names on our website.

San Francisco Bay Area | Boston | Colorado Springs | Ft . Lauderdale | Los Angeles | New York Metro
Northern Virginia | Portland | Pune | Sacramento | San Diego | Sydney | Toronto | Washington, D.C.