

TRENDS

Data as a Service Enables Infinite Insights

The Cloud Changes Everything: Enabling Next-Gen Apps
Powered by Data Meshes



Holger Mueller
Vice President and Principal Analyst

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EXECUTIVE SUMMARY

The information technology world has reached the era of Infinite Computing,¹ enabling enterprises to transform processes and ultimately powering their quest for the agility needed for market leadership. The ability to leverage data for better decision-making, by humans or by machines, is the key underpinning of the next-generation applications that make this transformation possible. And equally important, that ability must be delivered by the Infinite Computing enabler, the cloud, which powers data as a service (DaaS)—and with that, Infinite Insights.²

This report focuses on the introduction of DaaS, highlights two critical use cases, demonstrates how it can be delivered via one of the leading cloud platforms (Amazon Web Service), and lists key recommendations for CxOs implementing DaaS for Enterprise Acceleration.³

THE ERA OF INFINITE COMPUTING IS REAL

Historically, tools available to humankind 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 potential growth. Mistakes were costly. Had the “experience” concept been around at the time, CxOs would have known that mistakes in sizing lead either to bad customer and employee experiences (a system sized too small) or to financial inefficiencies (a system sized too big).

But over the last decade, Infinite Computing (see Figure 1) has emerged, freeing enterprise from the need to size their systems to hardware. More specifically, Infinite Computing enables Infinite Platforms that span across the following five logical layers:

- 1. Infinite Connectivity.** With the rise of the internet and all-you-can-eat pricing plans for network capacity, enterprises can assume their people and applications are infinitely connected with each other.
- 2. Infinite Insights.** For the first time in computing history, enterprises do not have to plan for storage of data and the set of questions they want to answer, a revolution led by the invention of Hadoop and the propagation of related technologies.
- 3. Infinite Compute.** The availability of the cloud and its offering of cheap compute gives enterprises the ability to no longer plan for computing needs, but rather to experience elastic compute from both an architectural and commercial perspective.
- 4. Infinite Machine Learning.** The combination of the Infinite Insights and Infinite Compute layers enables Infinite Machine Learning (ML; some marketing-minded individuals also call it AI), allowing enterprises to use ML where and when they need it.
- 5. Infinite Deep Learning.** Ultimately, the culmination of Infinite Computing is Infinite Deep Learning, where the combination of the four earlier-mentioned layers enables the learning of software and machines at an infinite level.

Figure 1. The Five Infinite Computing Layers



Source: Constellation Research

THE CLOUD POWERS DAAS

Traditional on-premises computing cannot power Infinite Insights, because platforms are sized by use cases, and that conflicts with the inherent nature of the Infinite Insights paradigm. The cloud, on the other hand, offers the unlimited computing capabilities necessary for delivering data-powered next-generation applications that allow enterprises to transform successfully in the era of digital transformation and digital disruption.

One of the most prominent next-generation application use cases is DaaS, which uniquely leverages the cloud's Infinite Computing capabilities—from Infinite Connectivity and Infinite Insights (providing an all-encompassing data mesh), to Infinite Compute (providing data management services such as extract, transform, and load [ETL] capabilities, data cleansing, and data anonymization), and finally to Infinite Machine Learning (to power and automate advanced DaaS use cases such as fraud detection). Figure 1 illustrates the five layers of Infinite Computing.

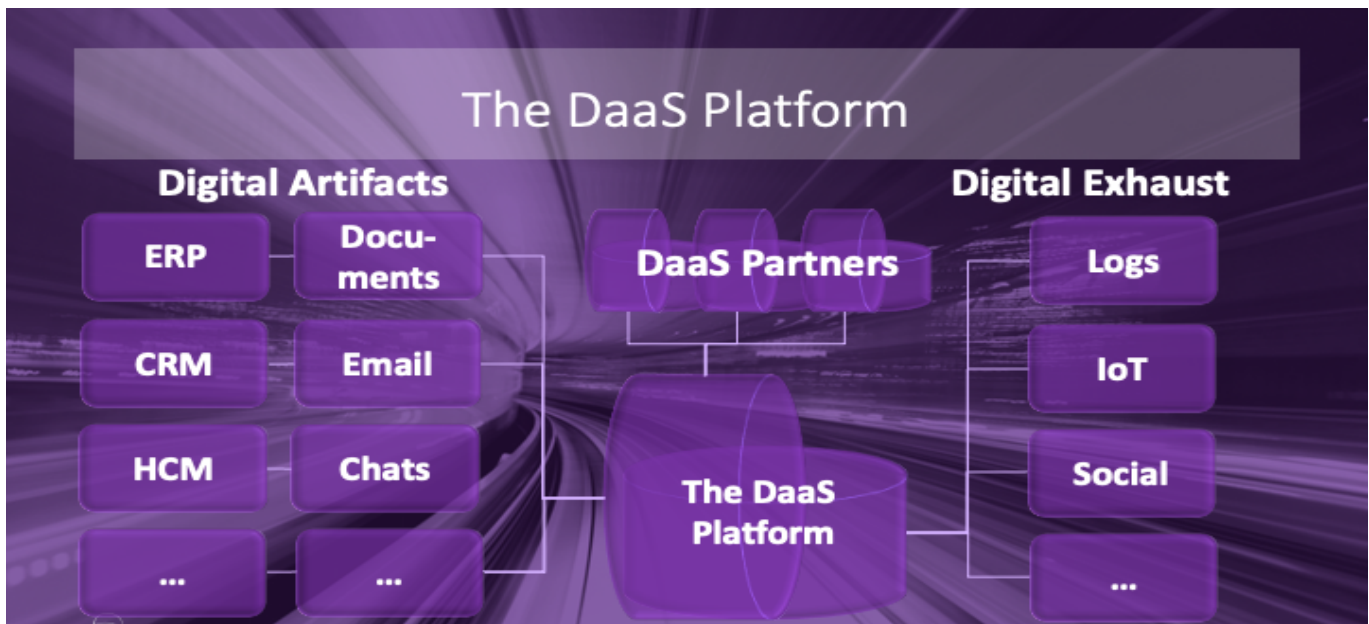
DAAS USE CASES

A few years ago, Constellation Research predicted that monetization of data would be a significant source of profitability for enterprises going forward. This will happen with the often-neglected fourth member of the “as-a-service” family, DaaS. Unfortunately, conventional data architectures have not been able to facilitate the successful operation of DaaS use cases. Therefore, enterprises must define and design new architecture to enable DaaS apps for the Infinite Insights journey (see Figure 2).

CxOs must begin their DaaS architecture approach with an inherent understanding that there is no finite estimate of the volume of data to be stored. This makes the Infinite Insights layer crucial for the challenges DaaS is meant to overcome. It is important to recognize from the start that DaaS not only enables exporting and monetizing data, but also allows enterprises to license and purchase data.

For DaaS to work effectively, additional capabilities running on top of the Infinite Insights layer are a prerequisite. Prominent among these are understanding who the customers and suppliers of data are, how the data is licensed, and how data can be shared and made available to the various parties involved in a DaaS scenario. A strong monetization offering, with an understanding of the licensing and consumption of the underlying data, may be required as well.

Figure 2. The DaaS Platform



Source: Constellation Research

As data becomes a strategic asset in a digital economy, the platforms for managing data become strategic as well. When building a DaaS platform, the define-and-design approach should follow these architectural components (see Figure 3):

- **The virtual data layer is the uber data management component.** Although there are ambitions for the universal data lake, such a lake will never encompass all relevant data for the DaaS automation needs of an enterprise. There are just too many potential and relevant data sources to import and integrate all of them into a data lake, and too many potential delays in doing so—especially when those delays lead to delivery time lags and possible business penalties. Therefore, every DaaS architecture should have a federation of data, ideally through a virtual data layer, that is powered by an elastic data mesh.
- **Services and APIs are the exposure aspect of the platform.** Direct access to data is always problematic: Too many things go wrong (data theft, performance issues, and more). Instead, a modern DaaS platform allows access to data via API-enabled services layers that take care of access rights and privileges, log usage and consumption, and security.

Figure 3. Logical Architecture of a DaaS Platform



Source: Constellation Research

- **Data security is an inherent platform characteristic.** Security needs to be “baked” into a modern DaaS platform. The potential risks of data breach, data theft, and other malicious data operations are too high for any enterprise to not have a built-in security layer as part of its DaaS platform.
- **Consumers use only APIs to access data.** DaaS consumers access data via APIs only, ensuring better policy adherence with respect to data access, usage, and operation. A key success factor for DaaS platforms is the ability to provision and monitor these APIs.

A modern DaaS platform can facilitate excellent vertical use cases. The following are among the most prominent:

- **Advanced analytics.** Traditional analytics looked only at in-house data. A modern, advanced analytics approach makes it possible to use third-party data to enrich and validate the in-house data. DaaS is a key enabler for procuring, licensing, and operating third-party data in compliance with contractual and regulatory agreements.
- **Benchmarking.** To benchmark performance in different areas of the enterprise, IT leaders require a platform that allows them to put in place agreements with benchmarking partners and to mask and neutralize data as specified in the benchmarking contracts, facilitating the continuous export/import of data. DaaS is the platform to power benchmarking for enterprises that have so far been able to look only at their in-house data.
- **Customer data hub.** Customer data is one of the most valuable assets of an enterprise, yet it’s highly fragmented and often is enriched with third-party data. With an effective customer data hub enabled by a DaaS platform, IT leaders can aggregate all of the customer data within the enterprise, enrich it via third-party data licensing, and satisfy regulatory requirements.
- **Data brokering.** Data is valuable, and enterprises may not only license and sell it but also may broker it against other data they are missing or want to enhance. Enterprises may also broker third-party data to their customers and suppliers. A DaaS platform makes this possible.
- **Data marketplace.** To be able to offer data at scale internally, data marketplaces are the right strategy to pursue. A data marketplace empowers enterprise users to not only understand what data they may

need to acquire or license, but also to continuously inject third-party data into their own data. On the other hand, by documenting second- and third-party demand for their own data, a DaaS-powered data marketplace can help organizations discover what value their internal data may have if monetized.

- **Data science.** Data scientists cannot rely only on in-house data as the base for their artificial intelligence/machine learning (AI/ML) models—they also need access to other data they can use to validate, cleanse, and enhance the existing data. DaaS platforms in combination with data marketplaces are key enablers for data scientists.
- **Fraud.** Globally, enterprises lose hundreds of billions of dollars every year due to fraud. DaaS can help IT leaders bring in a far better capability for flagging and reducing fraud, and for mitigating its intensity. Fraud-associated use cases will gain further momentum as enterprises embrace DaaS platforms. See the next section for one of the key fraud-detection use cases.
- **People data.** Information about people is highly fragmented, highly regulated, and often beyond the control of a single enterprise. When enterprises want to validate employment history or work references, they either need to work in a cumbersome manual fashion or they can use a DaaS platform to gain better transparency into people data.

FRAUD-DETECTION USE CASE

One prominent area for applying DaaS is in fraud detection. Fraud can happen at all levels of the enterprise, from sifting money; to falsifying travel and entertainment (T&E) claims and invoices; to bookkeeping fraud, falsified documents, quality control, and money laundering. Then there are types of fraud that apply to enterprise products, with credit card fraud being the most prominent (e.g., in the U.S., losses from credit card fraud were up to \$9.62 billion, or \$0.0678 per \$100 in volume, in 2019⁴). In addition, counterfeit goods damage brands, expose enterprises to lawsuits, and reduce revenue, while creating significant operational overhead.

Data is at the heart of uncovering fraud, so DaaS is a powerful strategy for helping enterprises reduce its effects—whether that fraud is related to internal procedures or to external ones focused on enterprise

products and services. The following are a few prominent DaaS-enabled fraud-detection techniques that can help address fraud better than traditional solutions can:

- **Transaction monitoring.** At the heart of any fraudulent activity are patterns that are not the same as those that occur in regular business operations of an enterprise. DaaS enables enterprises to continuously monitor ongoing transactions, identify patterns, test those patterns against any set of historical data, and test and validate anomalies against third-party data—all key fraud-prevention strategies. In addition, DaaS enables advanced strategies such as the sampling and randomizing of data to provide it to partners or external fraud specialists in a stable, automated, and repeatable way.
- **Credit card fraud.** Credit card fraud is one of the trickiest fraud areas to manage, because there is literally a subsecond response timeframe for deciding whether a credit card transaction should go through. To make that quick decision, credit card organizations are doing their homework with DaaS-powered data modeling solutions that allow them to identify credit card fraud patterns and prevent fraud via rules management or lightweight neural networks. DaaS is central to a successful credit card fraud strategy, because it allows the data management that is needed to not only find those patterns but also to simulate and validate detection.
- **Anomaly detection.** In the broadest sense, fraud changes data patterns across an enterprise. So, monitoring all internal data regarding anomalies and determining the cause of these anomalies is key for a successful antifraud strategy—e.g., anti-money laundering. DaaS plays a key role in this because the more data that can be included, the more anomalies that can be detected. Flexible access to historical data is key for instantly validating anomalies and understanding the possible extent of the fraud.
- **Data science.** Data scientists build AI/ML models, which operate on data. The easier their access to data, and the more easily data scientists can model, move, cleanse, and normalize data, the more productive they are in providing models that serve their enterprise. DaaS plays a huge role in data science, because it allows enterprises to operationalize the costs: Larger modeling efforts may be more cost-intensive, whereas smaller ones may be cheaper. Most importantly, using the DaaS solution means no platform-related costs occur from data science activity, thanks to the commercial elasticity of the cloud.

- **Advanced user profiling.** Understanding users and customers better is a key business strategy, which also applies for mitigating against the risk of fraud. DaaS platforms allow enterprises to collect and manage more user-based data, because they are inherently flexible when it comes to the scope of the collection. Moreover, the ability to license, broker, and swap user profile data leads to a more complete user profile, providing the enterprise with better user behavior analysis and improved ability to catch fraudulent activity.

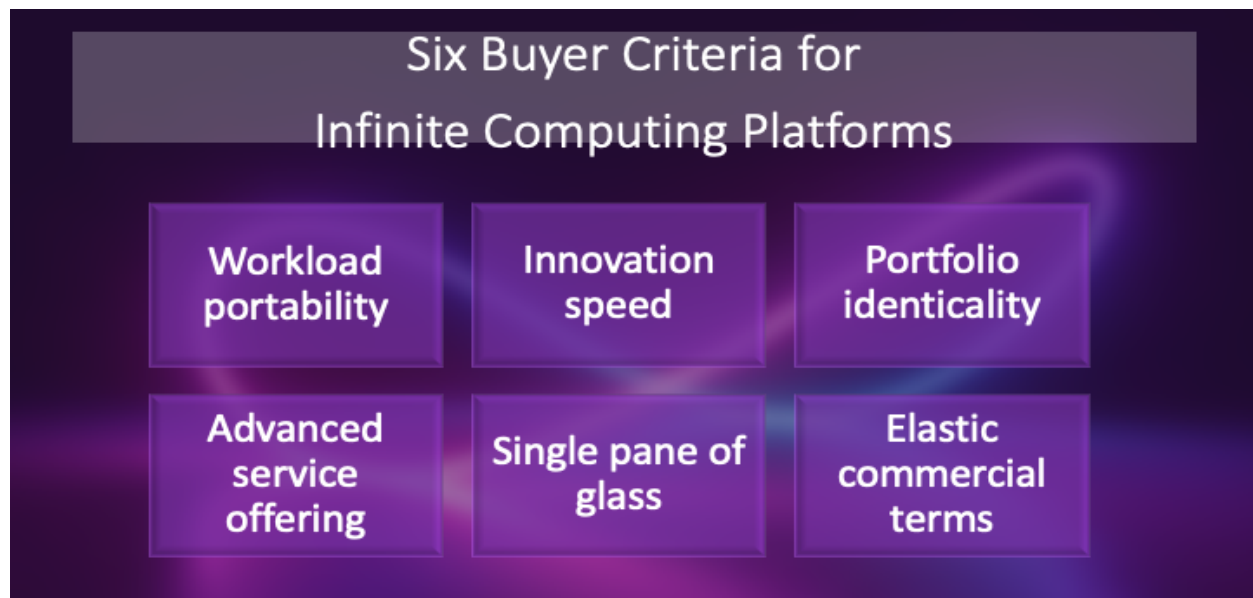
HOW CLOUD POWERS INFINITE INSIGHTS—AND WITH THAT, DAAS

To achieve Infinite Platforms that can power DaaS, enterprises need to successfully navigate the market trends for next-generation computing platforms, characterized by the six buyer criteria outlined below (see Figure 4).

Workload Portability

In uncertain times, 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.

Figure 4. Six Buyer Criteria for an Infinite Computing Platform



Source: Constellation Research

Legislative, data residency, privacy, and performance concerns are the main drivers behind this capability, apart from better resource utilization and flexibility. DaaS vendors with a broader overlap of cloud and on-premises capabilities generally do better with respect to this selection criterion.

Innovation Speed

Platforms cannot stand still, and as such need to keep adding new capabilities at a high rate. CxOs expect capabilities to be available simultaneously for cloud and on-premises platforms so that their application loads do not get shackled to one form of deployment. On the other hand, they realize that many 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 as on-premises options.

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, because the ever-expanding next-generation application portfolios rapidly consume additional services, and thus, may become dependent on a cloud-only deployment. CxOs do not want that form of lock-in, and therefore desire to see the same capabilities, with seamless usage, work across the cloud and on-premises.

Advanced Service Offerings

Thanks to 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. Moreover, the scale that infrastructure-as-a-service (IaaS) vendors can reach does not even consider the challenges 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 remote management capabilities, leaving their enterprises responsible only for physical security, networking, and power.

Single Pane of Glass

Managing workloads is complex, and because enterprises operate on constrained resources, CxOs require a single pane of glass for managing workloads in a next-generation computing platform. This is a win-win for enterprises and vendors: 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. To protect their own interests as well as retain the option of vendor/platform portability, enterprises should thoroughly evaluate the impact of long-term contracts. CxOs need to negotiate smartly and ensure contract terms do not bind their procured computing capacity to a rigid form, as the future will bring even more rapidly shifting computing demands.

AMAZON WEB SERVICES FOR DAAS

Amazon Web Services (AWS) has a varied range of commercial offerings and technology solutions for the DaaS automation and operation use cases; among them, the following solutions are most prominent and relevant:

- **Amazon S3/Amazon S3 Glacier provides the data foundation.** To enable DaaS, data needs to be stored in an efficient and cost-effective way. The answer for this at AWS is Amazon Simple Storage Services (Amazon S3), which allows for secure, durable, available, and virtually unlimited storage of all the information an enterprise needs for DaaS automation. And because information might become less relevant in time but should not yet be discarded, Amazon S3 Glacier provides an easy-to-use low-cost option for storing data long-term that falls into that category.
- **Infinite Insights are powered by Amazon EMR.** Hadoop-style query processes were and still are key for enterprises when they want to run their DaaS applications. For AWS, that solution is Amazon Elastic MapReduce (Amazon EMR), which allows enterprises to focus on transforming and analyzing

data, removing the worry of managing compute capacity or open-source products while still benefiting from the infinite scale and storage Hadoop-style data capabilities have delivered.

- **AWS Glue is what keeps DaaS together.** When it comes to managing data and integrating it across different platforms and processes, AWS Glue is the serverless ETL tool of choice. AWS Glue DataBrew provides a valuable tool for data science users to visually enrich, clean, and normalize data without writing code, and with AWS Glue Elastic Views a developer can easily build materialized views to power the relevant analytical insights a DaaS-using enterprise requires—with high performance.
- **Amazon Kinesis enables real-time analysis.** Some data needs to be captured and analyzed in real time, because it needs a fast response or is not relevant to be stored in its totality. Amazon Kinesis, a fully managed service, allows for the ingestion, buffering, and analysis of real-time streaming data as part of a DaaS platform.
- **Amazon SageMaker is the tool for AI/ML.** Almost every DaaS effort in an enterprise has an AI/ML angle, which makes Amazon SageMaker—the one-stop shop for all things AI/ML in AWS—a key offering for any AWS-powered DaaS platform.
- **AWS Data Exchange runs key DaaS automation.** A fundamental DaaS process is to enrich data with third-party data. AWS offers an easy-to-use solution with AWS Data Exchange, giving enterprises out-of-the-box access to several relevant data providers. More importantly, enterprises can also monetize their own data by becoming a data provider.

RECOMMENDATIONS

Constellation advises that CxOs—and IT leaders, in particular—should not wait for DaaS to become a best practice, because the transformative nature of its benefits elevates DaaS from a “nice-to-have” to a “must-have” facet of the enterprise IT approach. The disruptive potential of DaaS far outweighs that of traditional IT innovation—so much so that IT leaders who wait too long to adopt a DaaS play might not be found relevant for IT roles in the future. CxOs should begin their DaaS journey with the following principles in mind:

- **Do not wait.** Forward-thinking enterprises have already adopted DaaS platforms successfully as the disruptive potential of DaaS goes beyond traditional IT innovation. Compared with other IT innovations (e.g., client/server), the disruptive impact of DaaS will be so enormous that CxOs delaying DaaS adoption too long might be out of their jobs.
- **Leverage the tools and integration talent of IT and IT services providers.** Operating a DaaS platform offers tangible benefits, but most enterprises today lack the talent, scale, and proven integration approach to shape the platform swiftly. Though internal training and upskilling are crucial for DaaS capability, CxOs should not wait too long for the skills to be mastered. Instead, we recommend proactively enlisting outside help from tech providers and reputable systems integrators. Over the years, AWS has developed a strong ecosystem of IT services providers that enable the DaaS journey for global enterprises.
- **All data matters.** A key mistake that derails DaaS projects has its root in the legacy IT thinking—that is, sizing IT resources to the use case. In this case, the data. CxOs must remind their teams that all data matters for DaaS and no data should ever be prematurely discarded, because it might drive new, so-far-unforeseen, and never-asked-for insights.
- **DaaS lives in the cloud.** DaaS by its very nature is an infinite application because no enterprise will ever know for certain how much data and data processing (e.g., for AI/ML) they will need. Cloud offers a remedy to this demand for elasticity, from an architectural as well as commercial perspective. Therefore, successful DaaS implementations run in the public cloud.
- **Enable the AI/ML angle.** The real value of data is unleashed once the enormous upside of AI/ML automation is leveraged. CxOs should never lose sight of outcomes in general, and one of the most significant outcomes of a DaaS strategy is the enablement, operation, and management of next-generation applications fueled by AI/ML.

RELATED RESEARCH

For the CxO 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 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 importance of Infinite Computing, see: Holger Mueller, “Infinite Platforms Power Enterprise Acceleration,” Constellation Research, October 11, 2019. <https://www.constellationr.com/research/infinite-platforms-power-enterprise-acceleration>

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

For the importance of acceleration in the cloud, see: Holger Mueller, “Enterprise Acceleration Creates Imperative for Business Acceleration Clouds,” Constellation Research, February 7, 2020. <https://www.constellationr.com/research/enterprise-acceleration-creates-imperative-business-acceleration-clouds>

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>

END NOTES

¹ Mueller uses the term Infinite Computing to describe how computing resources have become nearly infinite for enterprises' purposes, effectively eliminating the need to size hardware resources. For more details, see: Holger Mueller, "The Era of Infinite Computing Triggers Next-Generation Applications," Constellation Research, June 1, 2018. <https://www.constellationr.com/research/era-infinite-computing-triggers-next-generation-applications>

² Mueller uses the term Infinite Insights to describe how Hadoop-style technologies have enabled a new class of insight-focused applications that never run out of potential data on which to base these insights and never limit the questions to be asked by business users. For more, see: Holger Mueller, "Infinite Insights Are the Architecture Imperative for Enterprise Acceleration," Constellation Research, July 14, 2020. <https://www.constellationr.com/research/infinite-insights-are-architecture-imperative-enterprise-acceleration>. Infinite Insights are the second layer of the best-practice Infinite Computing architecture Mueller describes here: Holger Mueller, "The Era of Infinite Computing Triggers Next-Generation Applications," Constellation Research, June 1, 2018. <https://www.constellationr.com/research/era-infinite-computing-triggers-next-generation-applications>.

³ Next-generation applications is used by the author to describe applications that use a combination of AI, big data, and cloud and then build applications across seven distinct use cases. Find more on next-generation applications here: 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>

⁴ For more, see: Nilson Report, "Card Fraud [Worldwide] Reaches \$28.65 Billion," December 1, 2020. <https://nilsonreport.com/mention/1313/1link/>

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, and PaaS, with forays up the tech stack into big data, analytics, and SaaS. Mueller provides strategy and counsel to key clients, including chief information officers (CIOs), chief technology officers (CTOs), chief product officers (CPOs), investment analysts, venture capitalists, sell-side firms, and technology buyers.

Prior to joining Constellation Research, Mueller 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—on both the application development (CRM, Fusion) and business development sides. Mueller started his career with Kiefer & Veitinger, which he helped grow from a startup to Europe's largest CRM vendor from 1995 onward. Mueller has a Diplom-Kaufmann degree from the University of Mannheim, with a focus on information science, marketing, international management, and chemical technology. A native European, Mueller speaks six languages.

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