

# Eight ways to modernize your data management

How to leverage artificial intelligence,  
handle growing data diversity and better  
integrate deployments





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## Introduction

Data isn't the same  
as it used to be



## Your data management shouldn't be, either

The days of data being narrowly defined as highly structured information from a few specific sources are long gone. Replacing that notion is the reality of organizations looking to leverage a wider variety of data types and structures coming from multiple sources. All of this is in service of providing everyone from IT, to line-of-business (LOB) employees, to C-level executives with insights that can have an immediate and transformative impact.

Effectively using and managing information is critical to pursuing new business opportunities, attracting and retaining customers, and streamlining operations. However, these needs create an array of workload challenges and increase demands on underlying IT infrastructure and database systems that are often not up to the task.

The question is, how will you solve for these challenges? Will you allocate more staff to keep up with patches, add-ons and continual tuning required by existing systems, or simply ignore the potential insights that lie in this wealth of new data? Many businesses are facing this challenge head-on by seeking out new solutions that leverage artificial intelligence (AI) as well as multiple capabilities and deployment options from on-premises, public and private clouds to innovate their data infrastructure and business.

This ebook presents eight ways in which enterprise architects and CIOs can modernize their data management to overcome information architecture challenges and identify new business opportunities, with included opinions from industry analysts and real-world customer experiences.

# One

## Drive optimization and app development with AI

To be competitive, organizations need to extract the deepest, most accurate and actionable insights from their data quickly enough to implement those insights when they are most valuable. Data-driven insights can spur organization-wide innovation, uncovering opportunities for new products or markets, empowering salespeople to have more meaningful discussions, and identifying internal processes that can be improved. [For that reason, many organizations are turning to data management solutions powered by and built for AI.](#)

### Powered by AI

Solutions powered by AI and machine learning (ML) directly optimize the performance of data management, which then has a ripple effect throughout a business.

For example, machine learning can be used to significantly speed up querying times by continually improving the path a query takes to the data. Moreover, it can be used to score query results based on confidence so that arriving at the best insights is much easier and more efficient. Incorporating natural language querying is also helpful so that LOB users can employ an Internet-search-like interface to draw insights from data directly—helping spread insights throughout the organization, removing internal bottlenecks and saving data scientists' and business analysts' valuable time.



## Built for AI

Solutions built for AI support the frameworks, languages, and tools that data scientists and application developers need to quickly implement AI in their projects without the delays of rewrites when taking prototypes into production.

A solution built for AI includes support for popular languages like Python, GO and JSON as well as Jupyter Notebooks. ML libraries and additional tools enable users to integrate AI applications with their data management solutions. With this, data scientists and app developers don't need to spend time learning and creating new code. Instead, they can begin working on projects immediately and borrow pre-existing code from prior work or libraries to arrive at a finished project faster than if they started from scratch.

### Data management check-in

- Does your data environment support the most popular data science languages and tools?
- Can your queries be machine-learning optimized and created using natural language?
- How fast are your queries returned, and are they based on confidence in their accuracy?

# Analyst heralds the rise of AI-infused data management

Analysts are taking notice of AI data management's ability to transform a company. 451 Research's recent report looks at why 88 percent of respondents from the most data-driven companies said, "AI and ML are an important component of their data platform and analytics initiatives."

They also outline the full range of AI use cases from automating repetitive tasks to automating complex tasks and augmenting people to do everything in between.



*"AI and ML are an important component of their data platform and analytics initiatives."*

451 Research: Accelerating AI with Data Management; Accelerating Data Management with AI. [Read the report](#) →

88%

## Two

# Enable rapid reporting and analytics

Several advanced technologies are available that help accelerate reporting and analytics, ranging from computing and processing to compression and data skipping. When combined, they have the ability to make significant improvements to the rate at which insights can be delivered. These technologies are particularly important for data scientists and business analysts—helping ensure the queries are returned more quickly, enabling businesses to make timely decisions.

### **In-memory computing with column-based shadow tables**

In-memory computing has become popular due to its ability to increase performance. However, not all in-memory databases treat data the same way. Because databases need read and write functionality they are traditionally organized into rows and require all data to be stored in-memory to achieve the desired performance improvements. Yet with data growing steadily it may not be possible for all data to fit in-memory. This is why column-based shadow tables are needed that can be analyzed in parallel to row-based tables. Reading columns is more efficient and the exact columns required can be put in memory for analysis. In addition, optimized data movement from storage to system memory to CPU memory found in in-memory columnar technology like IBM® Db2® BLU Acceleration® speeds the rate at which queries can be completed. OLTP and OLAP workloads can, therefore, be run in parallel in the same database, meaning queries can be run without migrating to a data warehouse and answers can be returned sooner.



### Active compression

Active compression enables data to be scanned or compared without decompressing it. So decompression can be limited to the required data and delayed until absolutely necessary. Databases achieve this by compressing each column with its own compression dictionaries and compressing data values that appear more often more than other values. This helps save time-to-insight by improving I/O throughput, while also conserving processing power and directly lowering overall storage costs.

### Data skipping

Data skipping helps save time when queries are being made by identifying data that is irrelevant to the query and ignoring it. Databases achieve this by keeping track of the minimum and maximum values of rows using metadata objects referred to as synopsis tables. When running queries, data skipping technologies review the synopsis tables for ranges of data containing a value that applies to the query and skip data that doesn't match. Because only the required data is read and used scanning is more efficient, reducing unnecessary I/O and speeding query execution.

### Data management check-in

- How much time do you spend waiting for data to decompress during analysis?
- Are queries completing fast enough for you to get the most out of the insights?
- Can you analyze transactional data efficiently without interrupting operations?

## How a global manufacturer cut reporting time by 98% using a few key technologies

For Knorr-Bremse, a manufacturer of braking systems, increasing its global presence through acquisitions and joint ventures meant a large increase in data volumes. They needed to process as much as 4TB of data per day. Selecting technologies like active compression, data skipping, and in-memory computing provided considerable benefits.



*“With Db2 BLU Acceleration we could decrease this reporting performance from 3 minutes to 3 seconds.”*

– Thomas Brauchle, Director of IT Architecture and Strategy, Knorr-Bremse

98%

## Three

# Lower your total cost of ownership

As IT budgets continue to plateau, it is more important than ever that organizations use financial resources and staff efficiently. Databases must provide cost-effective, industry-leading data management capabilities, while also meeting service level agreements (SLAs) with a breadth of fully managed services and enterprise-grade support.

### **Autonomic features**

Automating administrative tasks helps with both those goals by freeing up staff to focus on more strategic initiatives and accelerating workflows. Database solutions that can automate a range of administrative tasks—such as setup and deployment, workload management, resource utilization and storage management, as well as maintenance, upgrades and capacity expansion—are extremely valuable.

Saving administrative time and effort that might have been spent on rewrites is possible by choosing data solutions with cloud and on-premises options that share a common code base across deployments (even on competing clouds). A good example of this is the Db2 family of data management products.



## Reducing storage footprint

The Spiceworks “2019 State of IT” study revealed what companies of more than 5000 people spent on storage: 8% or more of their IT budgets, in the categories of hardware, hosted and cloud services, and managed services. Lowering storage requirements, therefore, can have a significant impact. This can be achieved through data compression and multi-temperature data management technologies that reduce the storage requirement directly, or by offloading “cold” data to more cost-efficient storage options.

Those looking to switch databases to save money and accelerate processes, without having to modify current applications, can also consider looking for solutions with cluster topology transparency. This means the solution does not require applications to be aware of the underlying cluster and database deployment, and therefore helps accelerate coding and testing and make application developers more productive.

## Data management check-in

- What level of automation is available in your existing system?
- How much time is spent on rewrites in your organization?
- Have you compared data management prices between vendors?

## How Owens-Illinois saw seven-figure cost reductions after modernizing

For global manufacturer Owens-Illinois, achieving cost reductions in the seven figures is no small feat. When those savings are also paired with faster transactions and decreased database and storage footprints nearing 50 percent, it’s a reason to tell the world. Discover their full story in the video below.

*“We’ve seen seven-figure reductions in our total cost of ownership, 50% storage reductions, and at least 20-30% performance improvements in transactional response time.”*

– Rod Masney, CIO of Owens-Illinois



50%

## Four

# Gain the flexibility to choose on-premises or cloud as needed

Depending on your unique needs, consider which deployments best meet your requirements: on-premises, private cloud, hosted cloud, public cloud, or a hybrid model that leverages various platforms. Because not all data is the same or has the same uses it is necessary to have access to a range of deployment options. Choosing a vendor that offers a breadth of deployment options capable

of supporting all aspects of your organization's strategy will provide better flexibility than any single-deployment seller can. In addition, if the deployments all come from the same family of data management products it is likely that they will have better integration than an architecture pieced together from point-solutions.

### On-premises

On-premises deployments provide a high level of control over optimization, data access and visibility, but require large investments in hardware and IT talent. They're most often used when security is paramount or regulations mandate such deployments.

### Private cloud

Private cloud deployments allow you to take advantage of the security of your own firewall while providing flexibility traditionally associated with the public cloud. The ability to use container technology is a considerable benefit for this type of deployment. Compared to virtualized machines, containers are easier to deploy quickly and often require less server space to operate.

### Hosted cloud

Hosted cloud environments remove the responsibility for acquiring and maintaining hardware, while allowing you to manage the system to some degree. Hosted cloud deployments are optimal for disaster recovery projects because you do not need to buy additional infrastructure and you have the ability to use existing database licenses. Hosted cloud integrates seamlessly with on-premises systems.

### Public cloud

Public cloud deployments provide the lowest amount of direct control over aspects like bandwidth and monitoring but have heightened flexibility. Rapidly adding additional public cloud capacity to supplement private clouds, known as cloud bursting, separating compute and storage needs, and paying only for what you use mean that managed cloud deployments are great options for backups and development, or testing environments.

## Data management check-in

- Can you support on-premises and cloud deployments on the same code base?
- How easy is it to add and integrate different data deployments currently?
- Are multicloud options available and how well are they integrated?

## Why a holistic, connected hybrid environment matters



Companies no longer feel bound to the false dichotomy of on-premises OR cloud and are choosing to look for vendors that can provide well-integrated on-premises AND cloud options instead. Learn more about the capabilities required to close the gap between different data management deployments.

Bridging to the cloud. [Read the white paper →](#)



## Five

# Increase scalability and constant availability

Keeping a business operating requires data systems that are up and running all the time and strong enough to handle the increasing amount of data generated by an enterprise. Continuous uptime and instantaneous responses are expected not only by customers and partners, but internally as well. Failures lead to missed opportunities to drive additional business based on insights, poor partner relationships, and loss of goodwill. The three most useful options for scaling and availability are described here.

### **Shared storage clustering**

One option is shared storage clustering, which allows work to be distributed among different nodes that all rely upon the same data source. Two key capabilities for shared storage clustering are automatic workload balancing across the nodes in your architecture and built-in automatic failover to use each node in the shared storage cluster as a failover node for another. Together these capabilities increase redundancy and avoid overworking certain nodes to lessen the chances of failure and better provide availability even in the face of disaster situations.



### Supplementing on-premises and private cloud with public cloud

On-premises and private cloud deployments can improve both scalability and availability with the addition of public cloud. This is achieved by using the on-premises and private cloud offerings as the foundational capacity while public cloud offerings are used when additional storage or compute capacity is required. Strong integration between cloud and on-premises systems is necessary to achieve this efficiently so that data does not become siloed based on deployment. Spinning up a public cloud environment that is complementary to an existing on-premises or private cloud offering can also provide better availability in case of planned or unplanned outages within the enterprise.

### Scaling cloud storage and compute independently

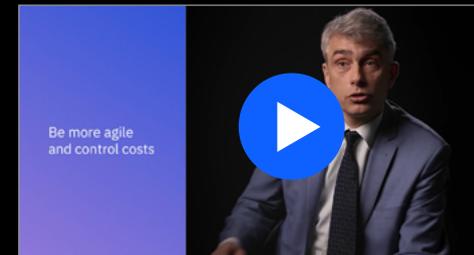
Businesses should be able to independently increase or decrease storage and compute for cloud offerings to address variability in cloud-specific workloads. With independent scaling, the cloud can increase compute to meet peak performance needs and scale back to save funds when that additional power is no longer required. Greater availability also requires less effort with fully managed cloud services such as high availability disaster recovery (HADR), daily backups, maintenance, and enterprise support.

### Data management check-in

- How much are you currently spending on data transfer fees?
- Do your cloud and on-premises offerings share a common code base, allowing better integration?
- Can you scale your cloud database storage and compute independently?

## Why the Dutch business intelligence center for healthcare uses cloud scaling

Vektis, the Dutch business intelligence center for healthcare, needed to create one version of the truth by moving from providing data itself—which could be changed and manipulated—to providing access to a single version of the data they collect. However, the company also knew it would need to scale to accommodate multiple users all entering difficult queries at the same time.



*“We wanted to migrate to IBM Db2 Warehouse on Cloud because of the flexibility to scale up and scale down again. It makes us more agile, but it also gives us control of the costs.”*

– Herman Bennema, CEO of Vektis

## Six

# Support new data types and sources

Multiple data types and sources are now more prevalent. Consider the dramatic growth of semi-structured and unstructured data generated from sources such as social media, sensors in machinery connected to the Internet of Things (IoT), and multimedia content repositories. Moreover, many of these sources are producing streaming data at a high velocity and volume.

By bringing together the data external to an organization together with what the business already collects, it can create deeper, more accurate insights capable of driving better decisions. For example, using internal data alone you might see robust initial sales for a new product. Combining this data with social media and other external unstructured data may tell a different story, though. By using sentiment analysis, a business would be able to tell if that product was bought frequently but provided negative experiences—allowing them to catch and correct the problem before sales dip.

However, combining internal and external data poses a new set of deployment and development challenges for the data infrastructure, which needs to provide the flexibility to serve, capture, store and process a wide variety of information types from different sources at different speeds. Businesses need a data environment that can serve data when and how it's needed and capture exactly what's happening at any moment in time.

Some of the most prominent examples of non-traditional data:



**Audiovisual content** provides the opportunity for organizations to tap into knowledge that might otherwise be difficult to find or review, adding valuable contextual information.



**Event data** delivers information that is often very time-sensitive. When captured and analyzed before it loses its relevance, event data can guide real-time action.



**Social media data** can inform a 360° view of customers, helping target marketing, drive increased sales, and quickly identify and mitigate any issues with customers or overall public perception.



**Data within physical documents** can be harder to access, but allows businesses to gain insight from information recorded manually, which can be richer and have more detailed context than comparable online forms.



**IoT sensor data** can provide alerts when machinery or production lines are at risk of malfunction, encouraging preventative measures as opposed to reactive actions.



**Email content** can and often does include audiovisual components, and also provides more robust information than what is reported, like survey data, or can be observed, like transactions.

Data  
management  
check-in

- How much unstructured data are you currently able to access and analyze?
- How often do you blend internal and external data to draw insights?
- How many IoT devices do your company or customers use on a day-to-day basis?

## How Capitalogix blends structured and unstructured data to create contextual meaning for hedge funds

With stocks held for an average of 20 seconds, the financial technology company Capitalogix is constantly seeking ways to gather more robust insight faster and stay ahead of market trends. To do so, they use a variety of structured and unstructured data at various speeds.

*“We have access to alternative data that might be totally unstructured: sentiment data from Twitter feeds and satellite imagery.”*

– Howard Getson, Capitalogix CEO



## Seven

# Integrate open source technology

Open source technology is a fundamental part of the modern data management landscape. It's impossible to overstate the importance of being able to leverage the effort of an entire development community, avoid vendor lock-in and take advantage of more data sources with open source options. When open source is implemented correctly it can lead to lower costs and better insights.

### **Leverage community innovation and avoid vendor lock-in**

Open source solutions are continuously improved by a community of individuals and sometimes businesses. The broad technical knowledge and number of skilled workers that can address any problem or new idea outstrips what a single company can do, leading to more innovative technologies. In addition to these cutting-edge technologies, open source solutions help mitigate the risk of vendor lock-in in a number of ways. Because the same open source technologies can be accessed from multiple vendors, it is easier to select a different provider without the hassle of recoding. Open source coding skills are also transferable, unlike the proprietary knowledge needed for proprietary systems. Removing vendor lock-in from the equation reduces costs by increasing the opportunities for competition.



**Gain access to more data**

Open source solutions also provide access to more data than might otherwise be put in traditional databases or data warehouses. For example, Hadoop is often the primary repository for unstructured information due to its ability to avoid assigning a schema when storing data. It is also possible to offload “cold” data into Hadoop from a data warehouse.

But access to more data through open source technology goes beyond Hadoop. Databases like MongoDB and PostgreSQL augment proprietary databases. MongoDB, for example, is a NoSQL-based document database. By storing data in JSON documents, it allows quick schema evolution typically not found in more structured relational databases. This makes it a good fit for use cases involving mobile applications, real-time analytics, and content management, all of which benefit from schema flexibility. Similarly, while PostgreSQL is a relational database, it augments rather than conflicts with existing relational databases in an organization. That’s because PostgreSQL is an object-relational database, which means it supports user-defined objects and how they behave for creating, storing and retrieving more complex data structures.

PostgreSQL supports data types such as UUID, monetary, enumerated, geometric, binary, network address, bit string, text search, XML, JSON, array, composite and range types, as well as some internal types for object identification and log location. While the full range of flexibility is not always needed, it acts as a useful supplement to standard relational databases. Ultimately these supplementary open source technologies allow access to more types of data from more sources, providing the extra information needed to draw deeper insights capable of driving business innovation and optimization for larger financial gain.

# Analysts recognize the total value of ownership of the IBM and Cloudera strategic partnership

The analysts at Cabot Partners understand that growth and positive impact of artificial intelligence (AI) is only possible through the right information architecture (IA). That includes enterprise-grade, open source solutions like the ones IBM and Cloudera provide. After conducting a Total Value of Ownership (TVO) study they concluded that “together IBM and Cloudera provide unprecedented flexibility, choice and value for clients in their journey to industrialize Analytics/AI.” Read the full report to see how the combination of these two open source leaders can help provide lower total cost of ownership, enhanced productivity, increased revenues, and risk mitigation.



*“Together IBM and Cloudera provide unprecedented flexibility, choice and value for clients in their journey to industrialize Analytics/AI.”*

Greater Choice and Value for Advanced Analytics and AI. [Read the report →](#)

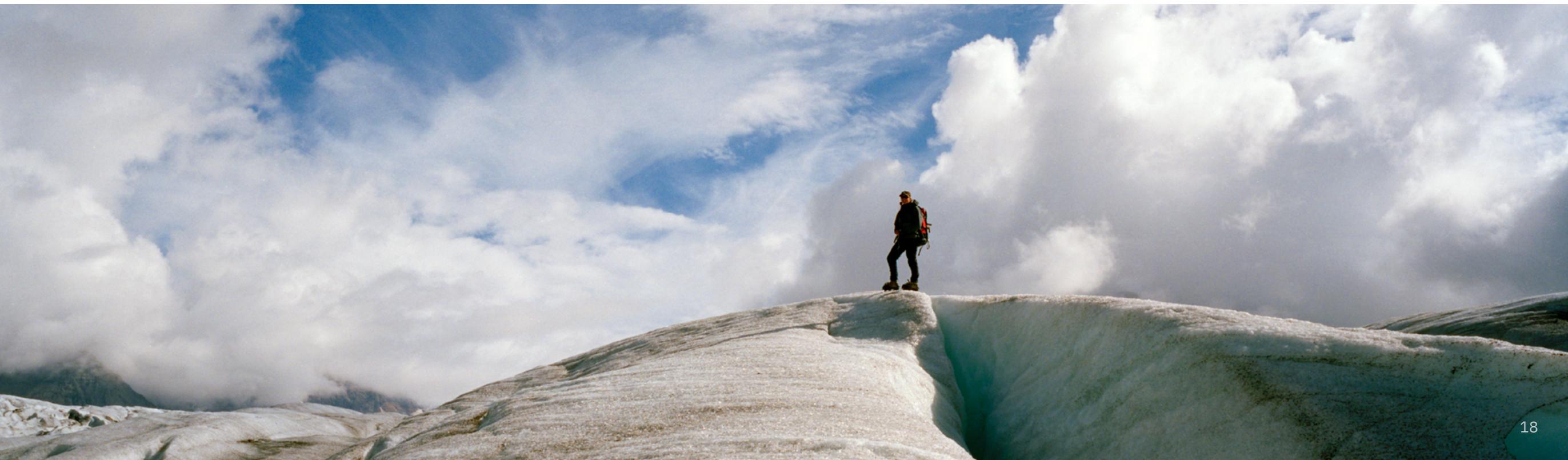
## Making the right open source selection

Enterprises must ensure that open source solutions are secure, well-integrated, and properly governed. Although this can be done in-house, relying on an enterprise-grade vendor's support and value-add solutions is often more efficient. Take security, for example; prepackaged enterprise solutions with security built in allow developers to focus on more valuable activities instead of taking time to establish access controls and integrate the system behind the company firewall.

For integration, the federation of data across Hadoop and the data warehouse using a common SQL engine is another area where enterprise open source solutions provide considerable value. Without this integration, for example, matching first-week sales data with social media sentiment data to provide a prediction of future demand would require much more effort. Enterprise-level governance also helps cut down on the effort required to bring data together. Without the metadata, cataloging and general organization of enterprise-grade, open source solutions that comprise a data lake, it can quickly become difficult to pull the exact data you need. Your data lake becomes what some refer to as a data swamp.

## Data management check-in

- Are you currently locked into proprietary solutions that could be replaced by open source?
- Does your business have specific use cases better suited to open source database capabilities?
- Do your current open source solutions have the necessary security, integration, and governance?



## Eight

# Incorporate newer streaming and fast data capabilities

Factors like the incredible growth of data, the increasing prevalence of AI projects, and greater understanding of the benefits of open source are changing the way in which companies capture and use streaming data. In fact, this shift is so prominent that some analysts have begun referring to this category of data management with the broader term “fast data” instead of the more narrowly defined “streaming analytics.” Upgrading to fast data solutions can help organizations rapidly ingest and use data, better incorporate open source technologies, and perform more robust analytics and AI.

### **Obtaining higher speeds, more data, and better insights**

IoT, clickstream, mobile app, and other forms of data that flow in rapidly from discrete events are, by their nature, fleeting. As such, to draw the most out of these valuable data points, a system of rapid ingestion is crucial. It’s now possible to store and analyze as many as 250 billion events per day with just three nodes on solutions like IBM Db2 Event Store. Prior technologies could require nearly 100 nodes to accomplish the same.

With this, organizations benefit in two ways, foremost of which is cost. The reduction in node requirements helps companies eliminate infrastructure costs through greater efficiency and put that money towards more innovative, meaningful projects. Secondly, because each node is more effective, keeping a similar number of nodes also allows a greater amount of data to be captured for more robust, complete insights. Think about clickstream data; each additional event captured is an opportunity to understand and respond to a customer better while they are on a website, providing the ability to adapt to their needs and hopefully increase profits.



### **Boosting fast data with open source**

Many of the same benefits of open source discussed in the previous section—such as reduction of vendor lock-in and access to more data—also apply when open source is incorporated into fast data solutions. However, the speed of event and streaming data imposes unique challenges. Solutions that can write to an open-format object storage such as Apache Parquet have also become popular recently to store large amounts of streaming data because it can be faster and cost less than other environments such as Hadoop. The ability to capture event data at incredibly high speeds depends as much on the repository as it does on the ingestion and analysis engine.

## Performing more robust analytics and AI

Newer fast data solutions take into account the wide range of analytics and AI use cases that must be addressed by making it easier to combine both historical and streaming data for insights. Because near-real-time analytics is important to act on many of the data types fast data solutions are built to capture, it is important that data ingestion is not done haphazardly. Achieving greater organization through memory optimization can help data be used more readily. A good example of this is alert monitoring. IoT devices monitoring critical systems send large volumes of high-speed streaming data for the purpose of alerts. The ability to analyze data that was properly organized during ingestion makes it easier to act nearly instantaneously as opposed to needing to wait until someone assigns a structure. When critical alerts are on the line, instantaneous action makes a difference.

Moreover, combining streaming data in the moment with historical data or data that was recently streamed enables a better context for analytics. Recently streamed data speaks to whether a data point is part of a trend or a one-off occurrence. Historical data can be used to determine which data points typically occur before an alert-worthy failure. This is also a great opportunity to introduce machine learning to continuously refine what is considered alert-worthy. By doing so, an alert monitoring system can become more accurate, saving the hassle usually associated with false alarms while still helping to prevent critical failures.

### Data management check-in

- Can you currently combine streaming and historical data for near-real-time decisions?
- How many nodes do you currently use and how many events does that allow you to process?
- Would being able to use an open data format for object storage give you needed flexibility?

# Forrester Consulting's recent study reveals more about the rapidly shifting fast data landscape

Forrester Consulting recently conducted a study of fast data (including streaming and event data) that reaffirmed its ongoing importance. Forrester surveyed individuals to discover the prevalence of fast data, both in terms of current use and future plans. They also noted hurdles that can lower the effectiveness of fast data solutions and provided some key recommendations.



*“88% say they need to perform analytics in near-real time on stored streamed data.”*

Don't get caught waiting on fast data.

[Read the Forrester Consulting study →](#)

88%

## Conclusion

# How to start modernizing your data management

Organizations' dependence on data is deepening with every day. This resource is growing rapidly, with more types and sources than ever before, presenting opportunities and challenges. That's why it's crucial to have a hybrid data management infrastructure that addresses these needs and grows with them.

To learn more about IBM Hybrid Data Management, contact your IBM representative or IBM Business Partner. You can also [start a free trial of IBM Cloud Pak for Data](#).

If you have any questions about this eBook, hybrid data management, or IBM Cloud Pak for Data our experts would be happy to have a free, 30-minute discussion to answer them.

**Ask an expert** →

### **IBM HDM and Cloud Pak for Data make the difference**

It's also crucial that your architecture is forward-looking, incorporating the AI, ML, and data science tools needed to continue to excel in this competitive environment while providing choice for deployment on premises, on private cloud, or across a variety of public cloud vendors. A wide breadth of data management offerings including database, data warehouse, data lake, and fast data capabilities is also essential.

IBM Hybrid Data Management provides the AI capabilities, deployment options, and range of solutions you need. IBM Db2 is powered by and built for AI, improving performance while providing the tools necessary to build AI applications. The common SQL engine IBM Db2 products are built upon provides improved integration capabilities and the ability to write once and run anywhere.

IBM's Hybrid Data Management products are available as part of IBM Cloud Pak for Data. By running solutions in a Kubernetes container with Cloud Pak for Data, these solutions become hardware agnostic and cloud agnostic—able to run anywhere that supports Linux containers or RedHat respectively. As an added benefit, data virtualization is included with Cloud Pak for Data, allowing you to run workloads more efficiently without moving data.

Growing your capacity is also simple with Cloud Pak for Data. Just add additional VPCs to access additional capabilities. This extends beyond hybrid data management extension and base offerings to solutions like IBM Watson Studio Open Scale so that all parts of the AI Ladder remain connected—allowing data to be automatically governed and used seamlessly in AI projects.



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