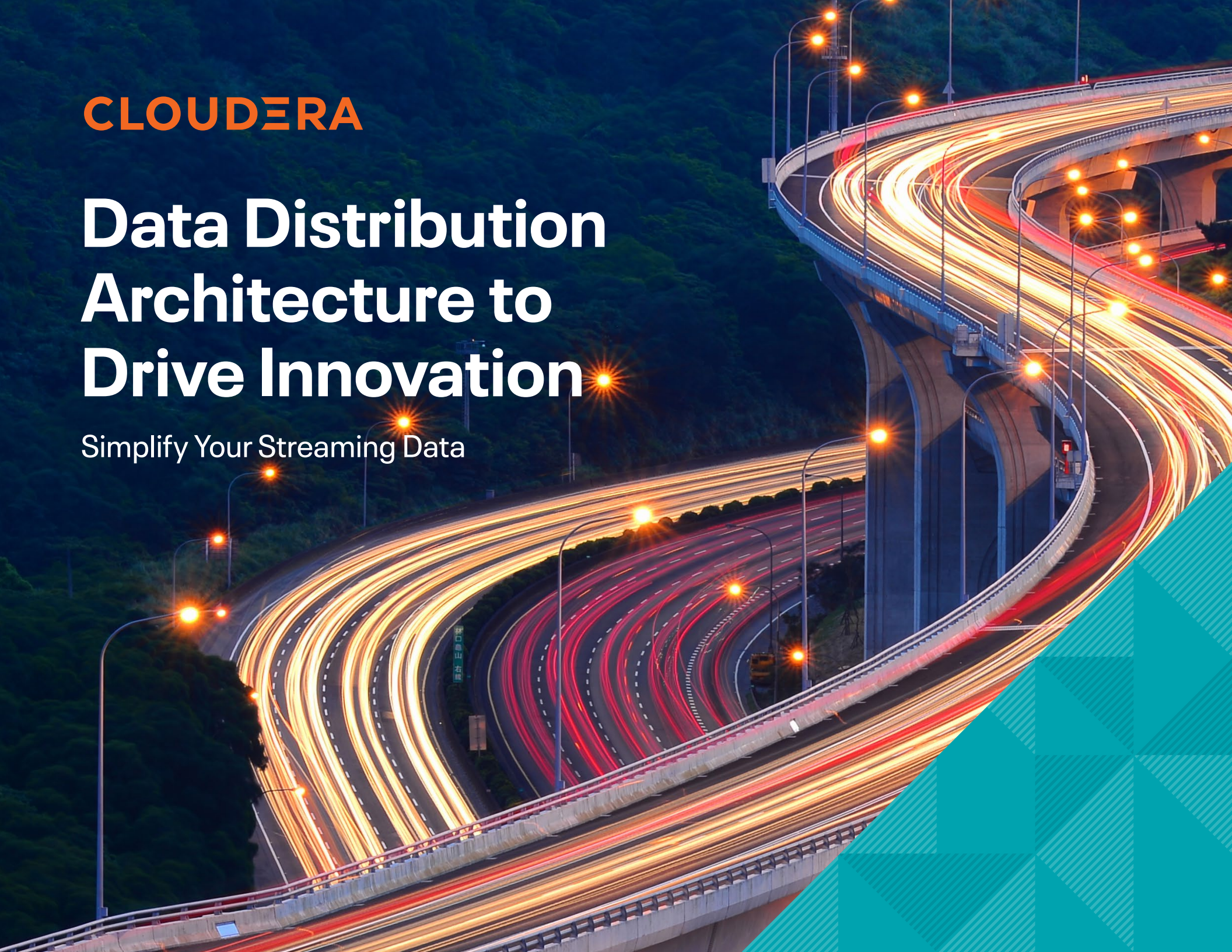

CLOUDERA

Data Distribution Architecture to Drive Innovation

Simplify Your Streaming Data

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What If You Could Simplify the Delivery of Data?

The exponential growth of data that is generated each year shows no signs of abating and is only matched by the significant increase in the number of systems that are needed to ingest, process, and store that data via a complex network of middleware and routers that transverse various hybrid cloud and on-prem environments that each have their own particular set of features and nuances.

That is how things are today. Your job to transform your organization from the relatively straightforward world of on-prem computing, with a small number of storage platforms, to a dynamic and complex world where data is constantly generated, distributed, and stored anywhere and everywhere can seem unrealizable. The point-to-point solutions that enabled you to deliver data before are now too complex to consider.

Let's take a common example where data is generated by mobile devices. It then needs to be captured and delivered to the cloud for future analysis and storage while simultaneously being routed to a real-time analytics pipeline where machine learning algorithms are executed. Furthermore, the results of those algorithmic processes must then be joined with data from other applications. In that scenario, there are a plethora of systems to integrate that essentially all use the same data but in different ways. In building a custom solution for each destination, an engineer cannot ensure that data can be rapidly onboarded and transformed to where it is best utilized for business and/or analytics purposes.

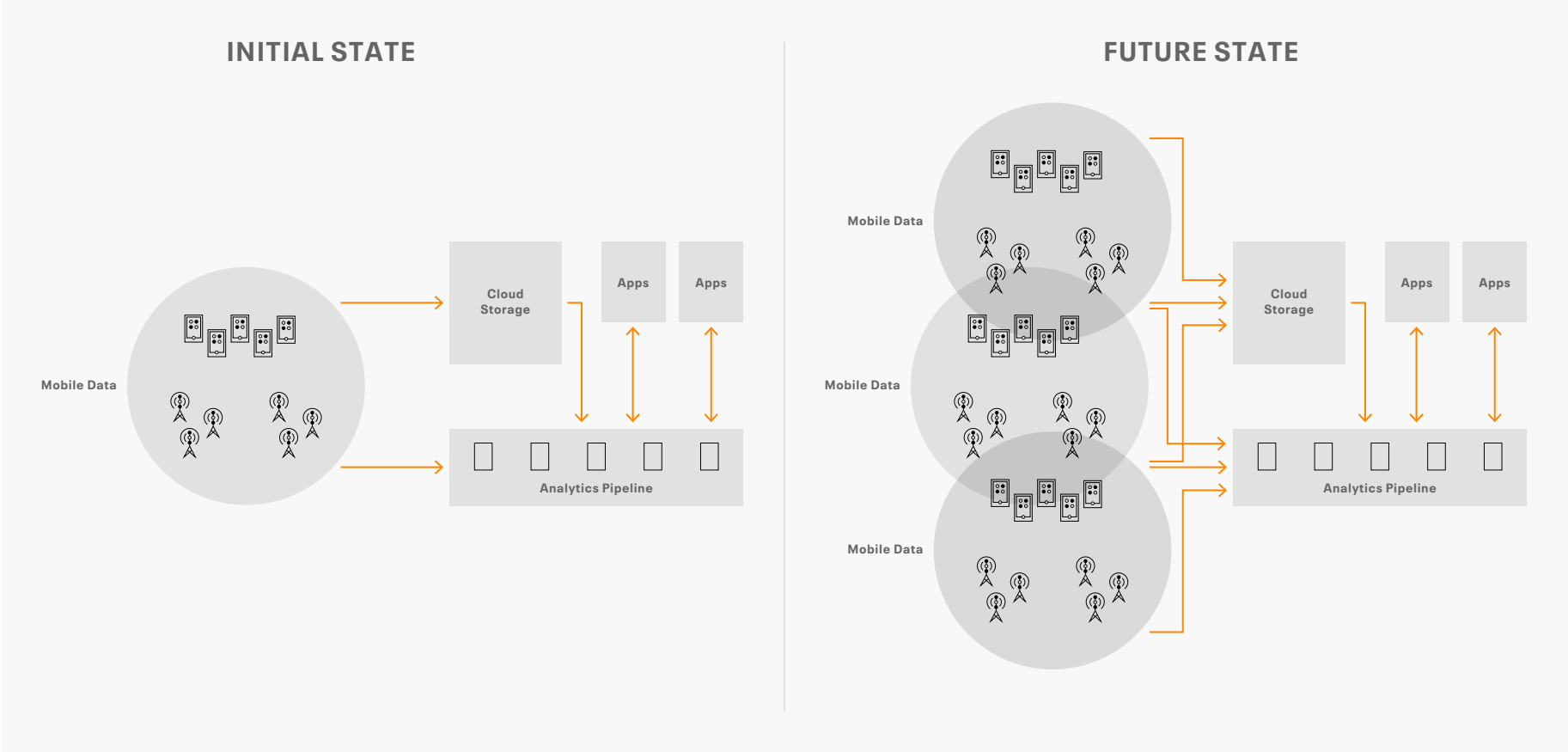


Figure 1: An example of the exponential growth of data in relation to mobile devices.

Managing business demand and complexity, while making sure that your team of data engineers and analysts are as productive as possible, is a challenge for every organization.

What if they, through a no-code point-and-click tool, could design the appropriate number of flows that move and enrich data from one location to the best location, quickly, easily, and in the most efficient way possible?

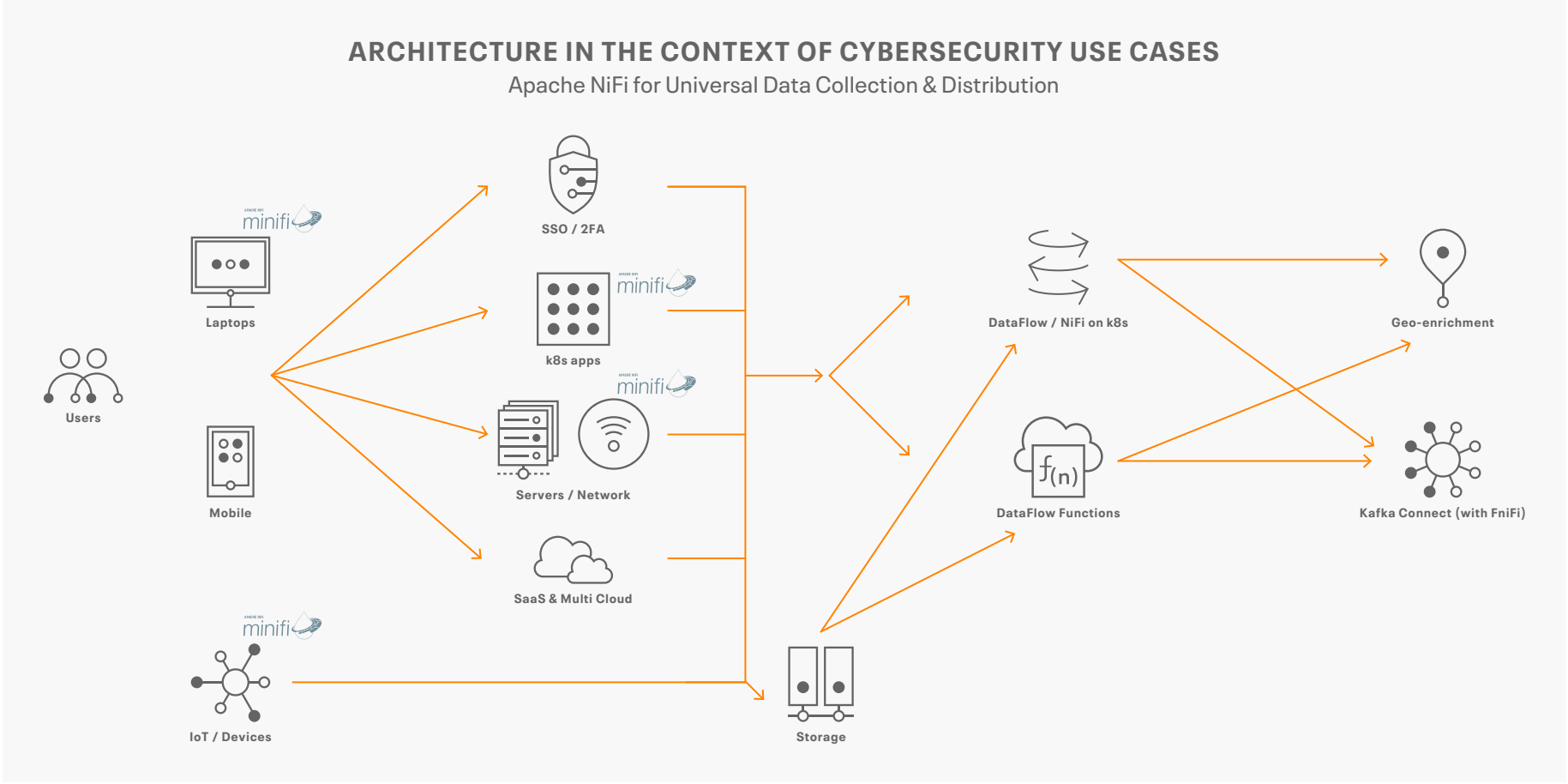


Figure 2: An example of a recommended approach to cybersecurity architecture.

Complexity Expands Exponentially

The complexity of data systems and infrastructure is increasing. Historically, there were a limited number of data platforms and so delivering data from one system to another could follow a traditional point-to-point model. Typically a central database contained all the relevant data and through a bespoke set of SQL scripts, data could be shaped and shipped to a few destination platforms. This model was relatively straightforward and not technically complicated since you were dealing with structured data and simple feed layouts.

Inevitably, limitations and inefficiencies with this model started to appear. For example, the development of new feeds often involved copying old ones and thus leaving the team with redundant code in numerous locations. The management and maintenance of these changes became costly and time-consuming, mostly due to non-standardization.

Today, delivering data is no longer solutioned by simply copying and writing a new SQL feed because there is often the need to map from one schema to another with a different data format.

Additionally, new layers of data distribution functions have made things immensely complex. For example, think about how difficult it can be to take a real-time JSON message, transform and store it in a relational database, write a copy to Amazon S3 (for future analysis), and all the while, enrich and stream it via Kafka to a real-time on-prem analytics service.

Business is moving along faster than it has in the past, and the changes that are needed to incorporate new data paradigms can no longer take months, but instead need to be done in hours or days.

Hybrid: Don't Forget On-Prem Connectivity

Before the advent of cloud services, most organizations had their own data centers and could pretty easily manage their infrastructure. Networks were tuned for high performance between servers and they could ensure that the connections between geographically diverse data centers had the necessary bandwidth to communicate effectively.

Compared to today, that was relatively simple. Organizations now utilize multiple cloud providers to guarantee stability and resiliency but even with this transition, many services are still run on-prem.

Imagine integrating thousands of nightly feeds between on-prem to several cloud providers.

Impossible? No.

Difficult? Extremely.

Is there a solution? Yes. Read on.

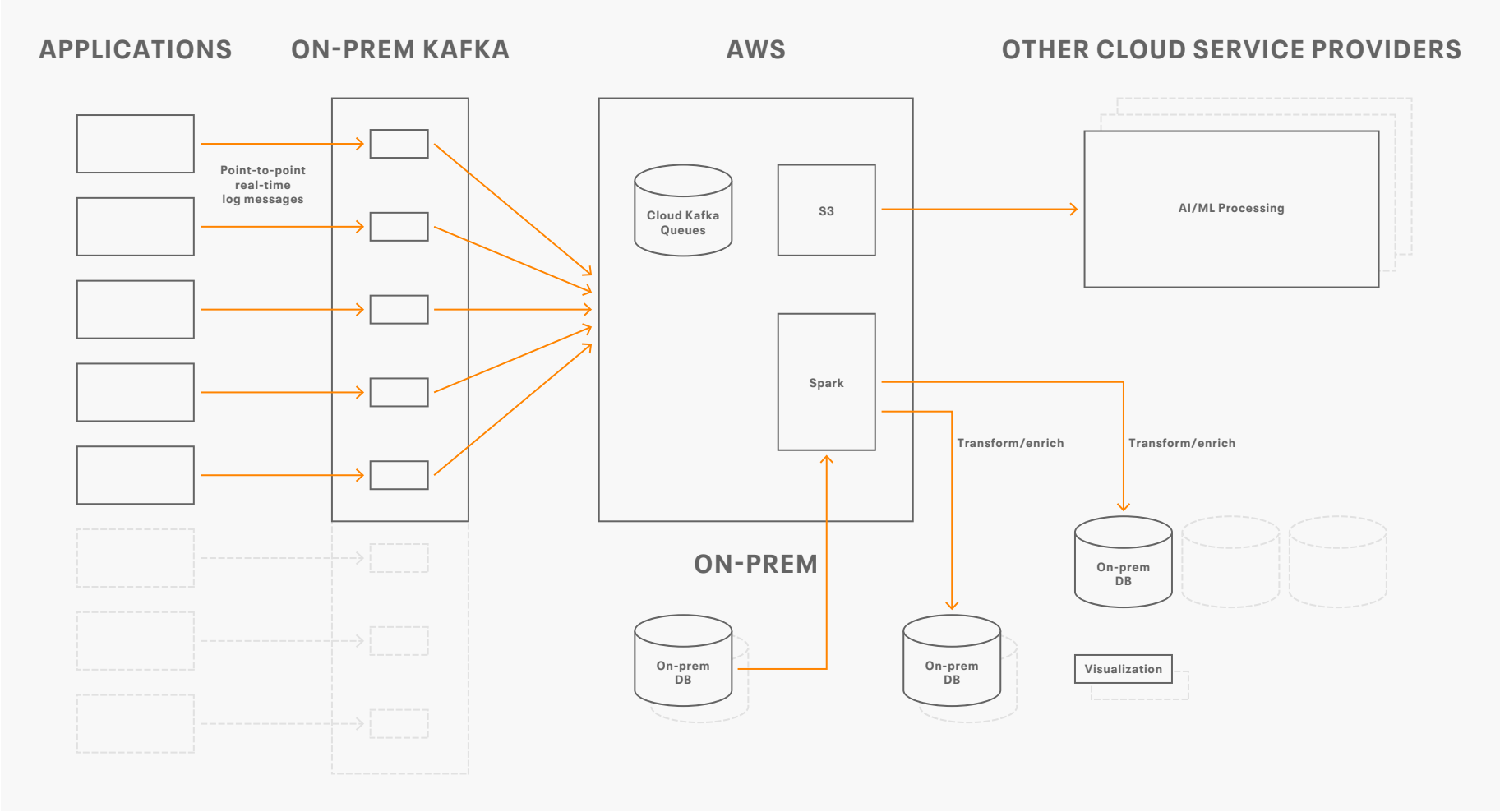
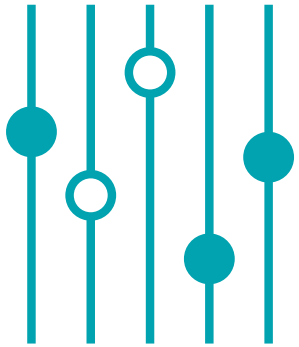


Figure 3: An example of the growing complexity of point-to-point solutions. Gray dotted shapes indicate expanding complexity.

Analytics and Data are Fundamental to Business

Data and analytics are the energy upon which corporations run and both are fundamental to every aspect of business execution. In order to make data and analytics work together, businesses need to have a clear understanding of what data they have, where it came from, and how it can be used to inform decisions. Additionally, businesses need the right tools and technologies to collect, transform, deliver, and analyze data.



From using historical data that analyzes the past and teases out new operational efficiencies to using real-time information for new product recommendations and to detect in-progress fraud, the variety, complexity, source, and structure of data has grown over a very short period of time.

The highest value is achieved by delivering information to where it is best utilized. Efficient data distribution is critical to maintaining a responsive, modern, and data-driven business. The very speed by which you and your team enable new data feeds is what will help your organization become digitally sophisticated and consequently, make the best use of the most updated data.

For instance, what if you could process and make available a new JSON message that holds a piece of information that would reduce your credit card fraud rate by 3%? The cost of not incorporating that information into your fraud analytics is now quantifiable because, without it, you are losing 3% of your sales to fraud every day. Being able to bring that piece of information into your fraud detection models and use it for decision-making is a huge opportunity and now takes on a new urgency. Tools like Cloudera DataFlow, enable you to rapidly bring that particular piece of data to where it is most needed. But this cannot be done through a traditional point-to-point model.

The Solution is Universal Data Distribution

Large data repository hub-and-spoke and point-to-point data distribution are examples of how organizations have not treated data collection and distribution as a first-class problem.

This is especially true with multi-cloud, hybrid cloud, and on-prem environments because building connectors to all the various systems and infrastructures is difficult. As the number of systems increases, the complexity and time of managing change becomes a significant obstacle to growth along with numerous other technical challenges.

Simplifying your streaming data, connecting to any data source, anywhere, processing, and delivering it to any destination is a necessity in business. A smart way to address this need is to establish what is called universal data distribution. This paradigm supports connectivity to hundreds of different applications and systems while allowing a developer or business user to graphically design new dataflows in a no-code UI as they are needed. With this, your organization will be able to take control of all its data pipelines in a way that allows for rapid deployment and easy management.

Support Active and Passive, Real-time, and Batch

There is a clear path to universal data distribution and integration if you can solve the root problems. Cloudera, working directly with their customers across many industries to integrate data across disparate systems, has found that there are actually only a finite number of challenges and that they are similar. Those challenges are:

- **Unifying different formats and schemas:** For example, transferring JSON messages to a SQL database
- **Bridging different protocols:** Moving data between different protocols such as Kafka messages into a document database or a cloud application such as Salesforce
- **Getting the right fit for batch and stream:** It is more efficient to move large objects in a batch and smaller objects in a stream

450+

Connect Them All

Cloudera DataFlow comes with an ecosystem of over 450 data connectors to integrate and distribute data universally, without worrying about the complexity and specifics of the architectures. It takes the hard part out of data integration and distribution, especially with the challenges that come with a complex multi-cloud and on-prem environment.

- **Filtering data:** Removing unwanted records for any number of use cases such as data cleansing or records that are not needed at the destination application
- **Enriching and sanitizing data:** Augment and enrich data with additional datasets or fix specific fields before they are transferred to the destination application

Moving towards a universal data distribution service remediates these issues and rather than having numerous tools and applications to manage data flow throughout the organization, you only need one.

Get There Faster, Cheaper, and Safer

A key feature of a data distribution platform is the breadth of available connectors and how easy it is to extend them to custom use cases. A comprehensive universal data distribution solution has these capabilities and it supports real-time and batch data alike, making connections between systems that have different characteristics possible.

Once you're able to connect any data source, you then address the data processing capabilities needed to route data based on content, filter out records, convert between data formats, and enrich data, all of which are critical functions to a data distribution layer.

Cloudera DataFlow (CDF) brings that all together and allows you to distribute data from any source, to any destination, through a no-code visual designer. There is no longer the need to utilize vendor specific platforms and one-off solutions to move data throughout the organization. CDF, with an ecosystem of 450+ connectors, gives you the ability to seamlessly integrate systems whether they are on-prem, in the cloud, or hosted vendor applications.

However, none of this is practicable without considering data protection. This single solution also comes with enterprise grade security and data governance that is fully integrated to facilitate greater security and data transparency. For example, with CDF, Cloudera customers gain an enormous degree of observability through built-in monitoring. With that, robust data provenance is established because data is tracked and monitored from the beginning to the end of the flow.

With CDF, data distribution is treated as a first-class citizen and will put you in a position to take back control of your data pipelines from disparate systems. Cloudera DataFlow helps your organization operate at the speed of business by delivering data where it is needed and faster.

90%

Faster response time for cybersecurity threats

It starts with the ability to connect to any data source that was created in any cloud or on-prem system.

The outcomes of implementing a universal data distribution model with CDF include faster response times and lower costs. See Use Case: Optimize Security Information and Event Management (SIEM) on page 16 for more information.

Implement a Universal Data Distribution Solution

Cloudera DataFlow (CDF) is an Apache NiFi based cloud service, which enables developers to connect to any data source anywhere with any structure, process it, and deliver it to any destination using a low-code authoring experience. In short, it's the foundation to enable universal data distribution in an organization.

Get Started Quickly

As part of CDF, ReadyFlows make it easy for developers to get quickly started by providing templates for the most common use cases. For example, moving data between Confluent Cloud and Snowflake can be accomplished with just a few clicks. The image of the ReadyFlow interface at the right shows how you would browse a gallery of common use cases from which to deploy your flows in minutes.

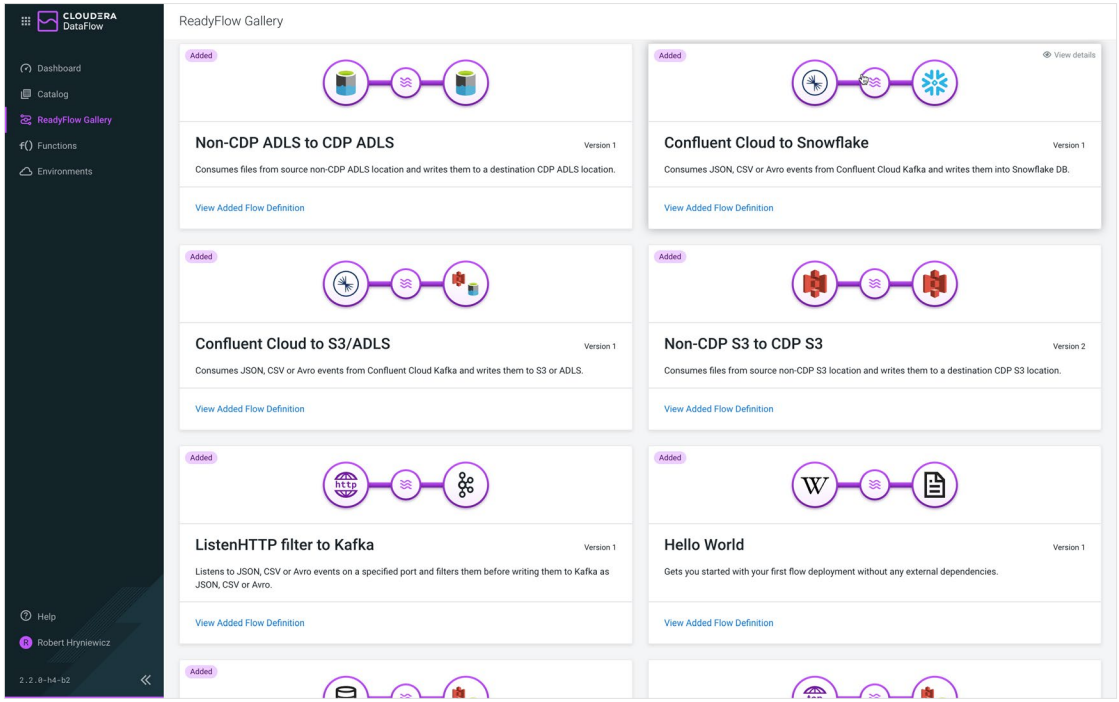


Figure 4: An example of ReadyFlow pre-built flow templates from which to quickly customize and deploy new data flows.

Optimize Through DataFlow Deployments and Functions

Once you have developed your flows, you need to decide how they will be productized and that depends on the use case, service level agreements, and other requirements. Cloudera DataFlow Deployments and DataFlow Functions provide the options you need to support fundamentally different runtimes so that you can design pipelines that best fit your needs. The table and the diagram below provide such a comparison.

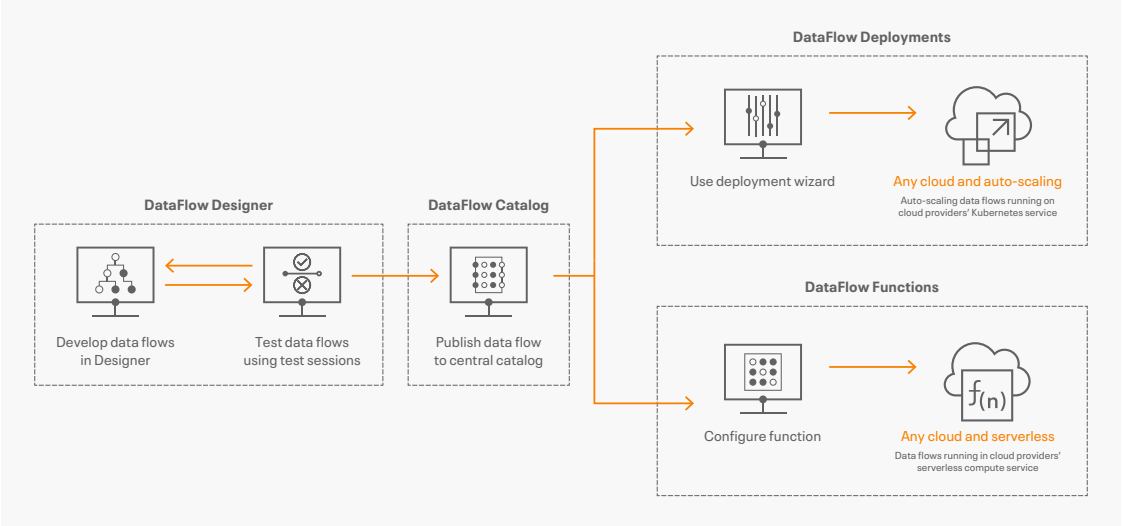


Figure 5: An example of how DataFlow is able to support fundamentally different workloads.

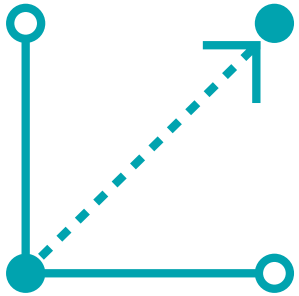
RUNTIME OPTIONS IN THE PUBLIC CLOUD		
Feature	DataFlow Deployments	DataFlow Functions
Cloud Runtime	NiFi Clusters using Kubernetes/Containers	Nifi flows running on cloud providers' serverless compute services (AWS Lambda, Azure Functions, and Google Cloud Functions)
Use Case	Use cases that need low latency for high throughput workloads requiring always running NiFi flows	Event driven, micro-bursty use cases with no sub-second latency requirement where NiFi flows do not need to run continuously
Benefits	Auto-scaling Kubernetes clusters for long running workflows with centralized monitoring	Efficient, cost optimized, scalable way to run NiFi flows serverless, allowing developers to focus on business logic

Self-serve Deployments to Different Runtimes

With over 450+ connectors and processors across the ecosystem of hybrid cloud services. CDF provides indiscriminate data distribution. Click here to learn about a few of the covered use cases, including:

- Serverless no-code microservices
- Near real-time file processing
- Data lakehouse ingest
- Cybersecurity & log optimization
- IoT & streaming data collection

Boost Developer Productivity



The capabilities so far described in this ebook tend to benefit flow administrators the most because they are free to choose and apply the best options from which to run their production data flows. It is important to note that Cloudera has taken a big picture approach, by streamlining the process from development to production for both flow administrators and flow developers alike.

CDF addresses the challenges and needs of flow developers with a self service solution. DataFlow Designer reinforces NiFi's most popular features through an effective and enjoyable user experience. With DataFlow Designer, developers can:

- **Quickly edit processor configurations** without losing focus on the big picture. This is done through a context-sensitive side panel that instantly displays relevant configuration information as you navigate through your flow components.
- **Directly upload JDBC Drivers, Python scripts, and other files** through the designer UI. Developers are now much more self-sufficient in building their own flows, not needing to wait on administrators to open up SSH access to each NiFi instance.
- **Immediately build data flows** without waiting for resources to be created. Developers are able to drag and drop processors to the canvas, create parameters and services, and apply configuration changes. When ready, they then initiate test sessions that provision and terminate resources on-demand. Not only are developers self-sufficient, the economics are better because resources are used only as needed.

The collaboration between flow developers and flow administrators is as follows: flow developers draft flows, build them out, and test them with FlowDesigner and then publish to the central DataFlow catalog. At that point, flow administrators can deploy them in their cloud provider of choice and benefit from the aforementioned features like auto-scaling, one-button NiFi version upgrades, centralized monitoring through KPIs, and automation through a powerful CLI.

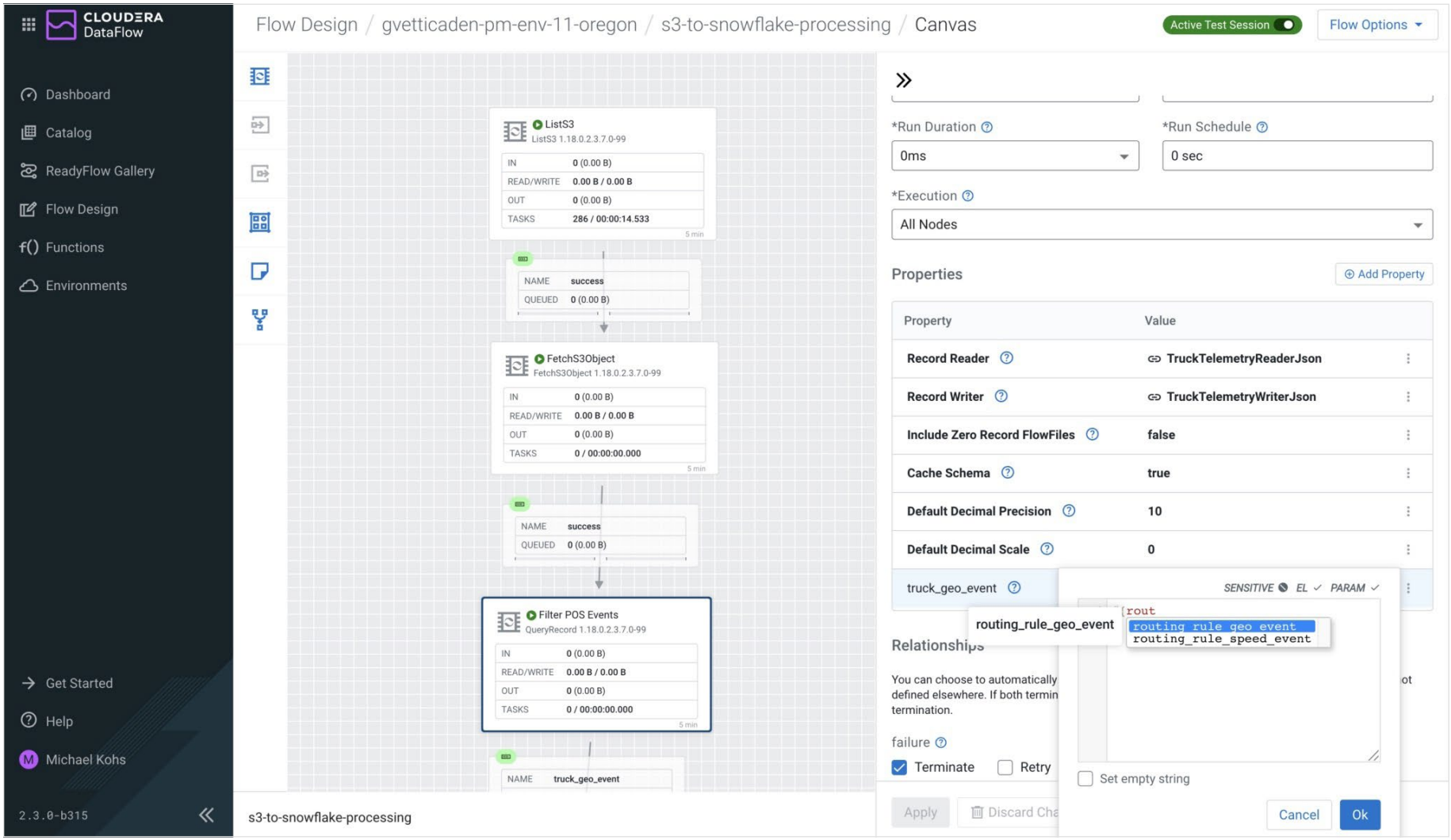


Figure 6: The context-sensitive side panel of FlowDesigner enables developers to quickly edit processor configurations without losing focus on the big picture.

CASE STUDY | Retail

Point-of-Sale Systems

Challenge

This multinational retail company has a valuable network of thousands of point-of-sales (POS) systems across the globe that collects real-time streaming data. To expand the network and grow their business, they needed a more effective way to collect and safely distribute data across several cloud services and geographic regions. This posed a number of challenges.

- Ensure compliance with a complex array of regional data privacy regulations
- Minimize point-to-point solutions
- Maintain a global view of operations to manage and monitor global data flows
- Implement agile and scalable development and deployment processes

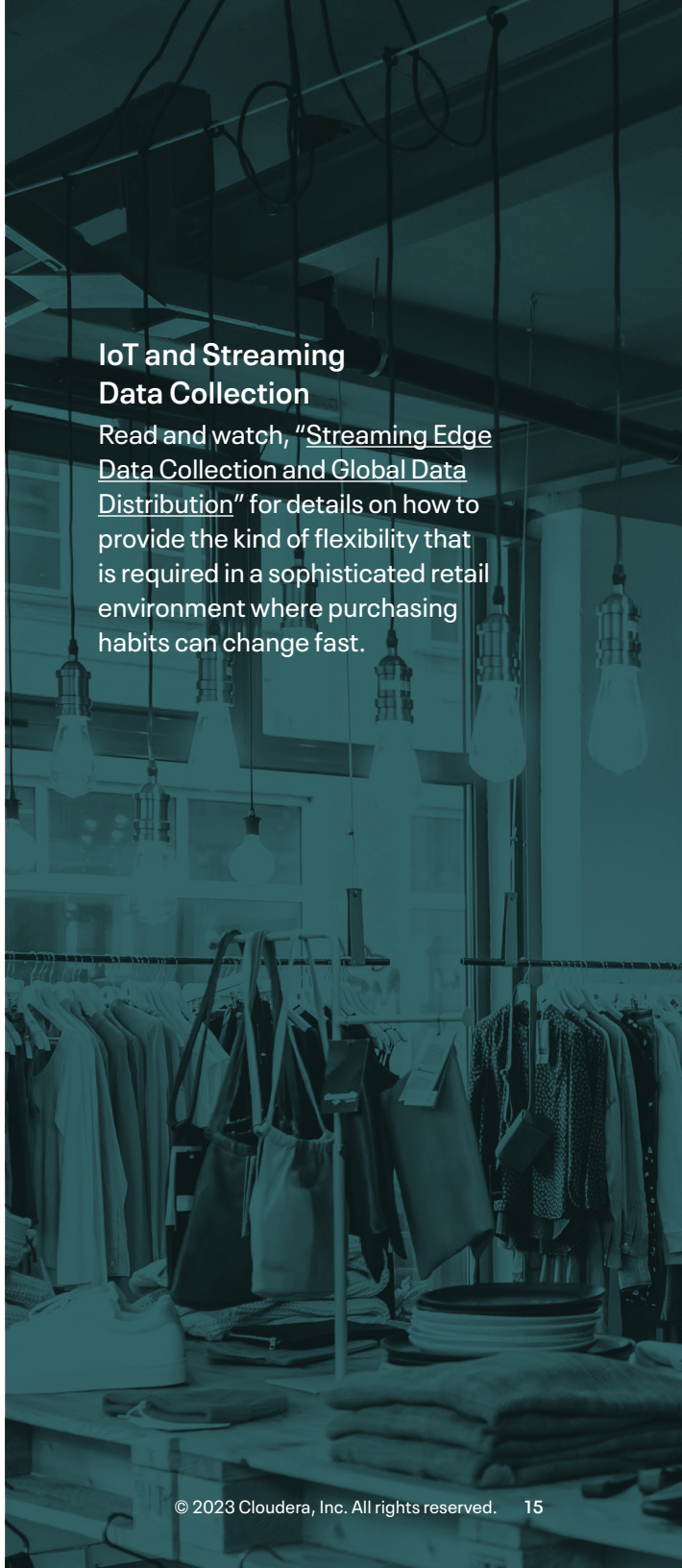
Solution

- Cloudera DataFlow (CDF)
- Cloudera Edge Management (CEM)

Outcome

Utilizing CDF services to manage universal data distribution and CEM edge agents to implement collection and tranformation logic closest to the POS terminals, this previously intractable problem is now a highly manageable solution that allows for growth, scalability, and flexibility.

- CEM enables data to be processed within the POS region of origination and to distribute it only after data redaction and other data privacy requirements are fulfilled.
- Point-to-point solutions are minimized because each POS client streams data to one set of ingress gateways that automate the creation of load balancers, DNS records, and certificates as specified by the respective downstream cloud providers. CDF then powers the distribution to diverse destinations, including Snowflake, Kafka, and several cloud analytics services.
- CDF with CEM provides a centralized view of the distributed assets for management and monitoring across all edge agents and regional data distribution flows.
- Through a no-code point-and-click tool, developers are able to design the appropriate number of flows that move and enrich data from one location to the best location, quickly, easily, and in the most efficient and scalable way possible.



IoT and Streaming Data Collection

Read and watch, "Streaming Edge Data Collection and Global Data Distribution" for details on how to provide the kind of flexibility that is required in a sophisticated retail environment where purchasing habits can change fast.

CASE STUDY | Oil and Gas

Optimize Security Information and Event Management (SIEM)

Challenge

This multinational oil and gas corporation succeeded in building a manufacturing data lake that maximizes a hybrid, multi-cloud environment to power real-time analytics while providing a consolidated view of its operations.

Among the many obstacles they had to overcome related to the development, deployment, and management of global dataflows, particularly with regard to cybersecurity. Their mission to optimize log analytics for security information and event management (SIEM) included these challenges:

- Ingest data from multiple clouds and on-prem sources, including PCs (100K+), Linux servers (30K+), and global network routers
- Process and distribute multiple data formats to applications hosted across cloud and on-prem environments
- Lower the cost of log analytics so that budgets could be repurposed to high value initiatives
- Increase the speed of threat detection

Solution

To address this particular challenge and gain additional flexibility, the oil and gas corporation established a universal data distribution model powered by Cloudera DataFlow (CDF). With CDF, developers connect to any data source anywhere with any structure, process it, and deliver to any destination using a low-code authoring experience.

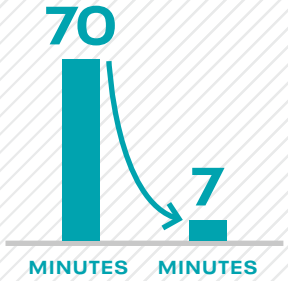
In this particular case, Apache MiNiFi is used to capture logs from their multi-cloud environment because it proved to be an effective choice for collecting data out of Windows operating systems, ingesting log data from over 100K PC's around the world in real-time. NiFi is then used to parse, process, and distribute specific types of log data to the respective applications regardless of where they reside. Additionally, autoscaling and stabilization was facilitated through NiFi data collection flows.

The Big Hybrid Picture

Read more about how a universal data distribution model powered by Cloudera DataFlow is a critical piece of a larger hybrid success story for a multinational oil and gas corporation.

Outcome

The CDF universal data distribution model was implemented as an integral part of the hybrid manufacturing data lake and continues to be critical to keeping operational overhead and infrastructure cost low. Additional impacts of this initiative are shown below.



Mean time for detection for cybersecurity threats has gone from 70 minutes to 7 minutes

Reduction of $2 million in licensing cost over five years

Search applications were accelerated by 55%

Logs were reduced by 60%

Infrastructure cost reduced by 30%

Go to the Next Level

Getting your universal data distribution right is fundamental to your efforts to transform your organizations from the relatively simple world of on-prem computing to a constantly dynamic and complex world, where data is constantly generated, distributed, and stored everywhere.

Once your data is moving you can start to address your needs for real-time analytics and stream processing.

With Cloudera DataFlow, the aspirations to help your organization to become digitally sophisticated is no longer a futile pipe dream, but an entirely possible event.

Learn More

To learn more about implementing your own IoT use cases, ingesting data into your data lakes and lakehouses, or delivering data to various cloud services, take our interactive product tour.

About Cloudera

At Cloudera, we believe that data can make what is impossible today, possible tomorrow. We empower people to transform complex data into clear and actionable insights. Cloudera delivers an enterprise data cloud for any data, anywhere, from the Edge to AI. Powered by the relentless innovation of the open source community, Cloudera advances digital transformation for the world's largest enterprises.

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