

eBook  
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# Google Cloud Reference Architectures for Data-Driven Application Builders



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# Welcome to Actian's Reference Architecture Guide for Google Cloud

Actian is empowering the data-driven enterprise with an end-to-end data management platform to meet the needs of the most demanding analytics use cases from the edge to on-premises and the cloud.

Thousands of forward-thinking organizations around the globe trust Actian to help them solve their toughest data challenges and to transform how they power their businesses with data.

## Actian and Google partnering for better data driven outcomes

Actian and Google combine to create a solution that helps everyone in your business to drastically improve their real-time decision-making capabilities with better insights from real-world, operational BI and analytics workloads via a self-service, fully-managed cloud service.

This reference architecture eBook is designed for application builders looking to leverage the Actian portfolio, and the Google Cloud Platform in combination with the ecosystem to address a wide range of cloud data warehouse, analytics, integration, and edge use cases. These reference architectures are taken from real-world customer experiences and deployments, to serve as a guide for designers looking to understand what is possible with Actian's innovative portfolio.

More detailed implementation guidance is available from Actian's sales and technical teams. Please contact us to learn more today at [www.actian.com/partners/google-cloud](http://www.actian.com/partners/google-cloud)

## Introducing the Actian Portfolio



### Actian Avalanche

The hybrid cloud data warehouse with powerful built-in self-serve data integration that delivers unparalleled analytics performance for data-driven enterprises of any size, no matter where their data resides. With the industry's lowest overall TCO.



### Actian AvalancheConnect

A versatile built-in enterprise data integration solution that empowers anyone to integrate anything, anywhere, anytime with pre-configured connectors for over 200 enterprise applications and data sources.



### Engineered for Google Cloud

Designed for Google cloud and built on Google Kubernetes Engine (GKE) with native support for Google Cloud Storage delivering flexible and scalable data warehouse with full separation of compute and storage.

# Customer 360 Real-time Analytics

A true 360-degree view of a customer can't be sourced exclusively from internal data let alone from a single system or department. Traditional CRM and data warehouse systems can't handle all the data sources needed. Actian simplifies customer analytics with a modern hybrid-cloud data analytics platform with built-in data integration and prep, accelerating the mining of available data sources and delivering 360-degrees of actionable customer insight.

With Actian's analytics portfolio, organizations can rapidly personalize the customer experience through micro-segmentation, next best action, and market basket analysis while improving customer acquisition and retention through campaign optimization, and churn analysis to increase customer loyalty.



## Customer Profile

Granular, multi-channel, real-time customer profile analytics can tell you about your customers, the best means to connect, the targeted offers that will resonate, their predilection to churn, and the best ways to personalize the entire customer experience to win more business and drive-up loyalty levels.

## Micro-Segmentation

Create superior customer experiences with targeted offers and responses resulting in a higher return on investment. Uncover relationships between customers and key purchase drivers deriving the value of each customer while identifying new segments that provide a competitive advantage.

## Next Best Action

Maximize long-term customer value by not only predicting what a customer will do next but by influencing their next action as well.

## Campaign Optimization

Stand out in a crowded market and capture more wallet share using Actian to deploy effective, innovative, highly personalized campaigns through deep analysis.

## Market Basket Analysis

Increase revenue by uncovering your most profitable product groupings, learn which products benefit most from associations with other products, understand optimal shelf arrangements, and better target marketing and promotions.

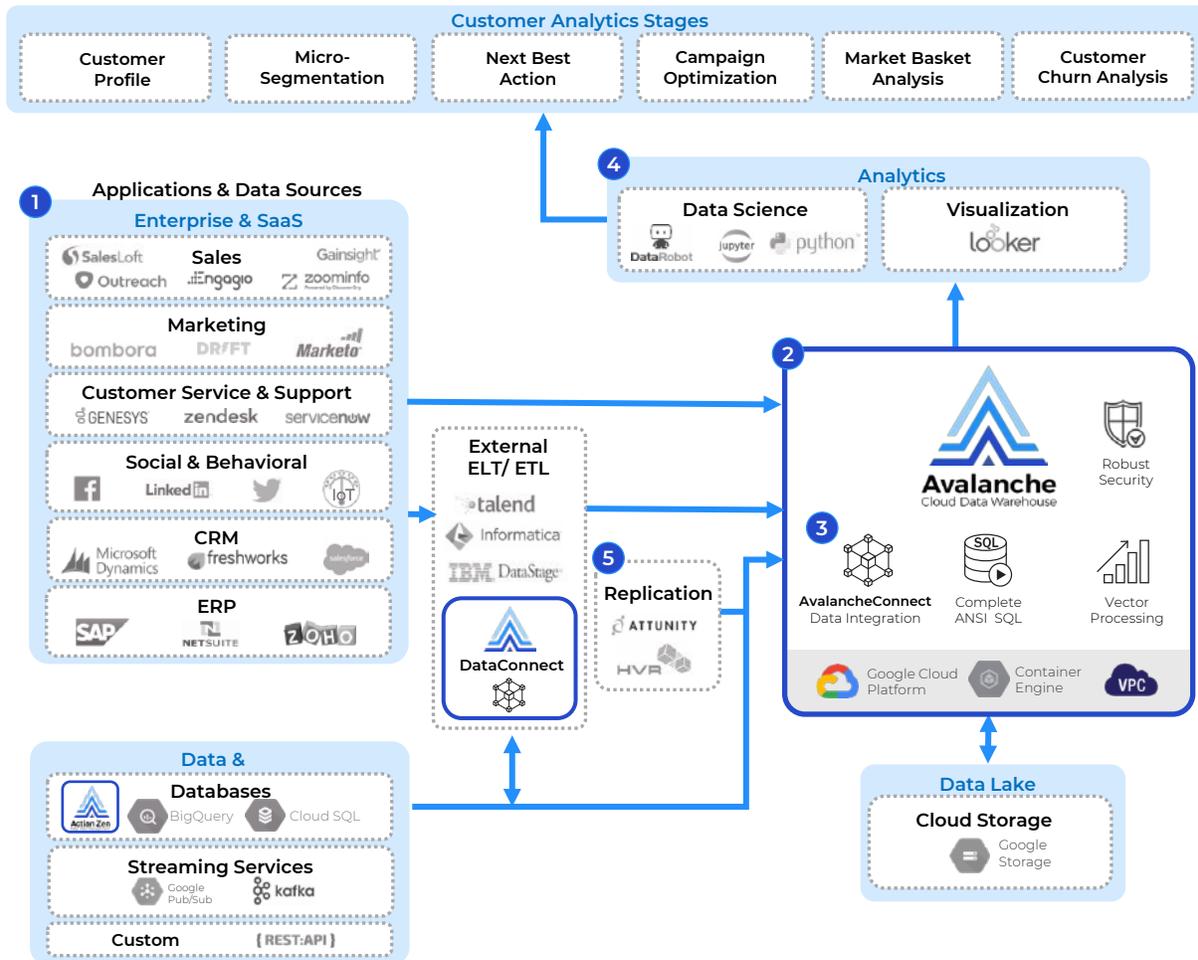
## Customer Churn Analysis

Discover customer classifications and assign customer lifetime value and churn scores to understand and monitor which customers you can't afford to lose. Generate raw churn predictions informed by individual customer profitability.

“Our business users can now analyze all our markdowns, and with a much finer granularity. They can drill down and gain insights into sales and marketing performance that weren't available before.”

– Jean-Francois Rompais,  
Head of IT Architecture, Kiabi

# Customer 360 Real-time Analytics



## Reference Architecture

### 1. Customer Profile Aggregation

Real-time analytics for Customer 360 requires data aggregation across enterprise apps, data lakes, and external data sources.

### 2. Real-time Customer Analysis

Action Avalanche Cloud Data Warehouse delivers superior price-performance delivering analytics for actionable insights in real-time.

### 3. Built-in Data Integration

Action AvalancheConnect includes drag-and-drop support for thousands of different applications and data sources.

### 4. Popular BI, Data Science Tools

Avalanche has built-in support for popular BI and Analytics libraries, visualization, and data science tools and platforms.

### 5. Patented Approach

Action Avalanche's patented trickle-update capability supports near-real-time replication from operational systems.

# Healthcare Analytics

Action's portfolio of analytics and enterprise data management solutions help both healthcare payer and provider organizations leverage analytics to protect against fraud, increase care delivery provider efficiency and accuracy while accelerating the transformation to an outcome-centric model.

With Action organizations can bring together data from any source into a high-performance hybrid-cloud data warehouse that can support even the most demanding workloads.

## Healthcare Fraud Detection and Prevention

With the complexity of medical procedures, variety of goods and services, medical billing is prone to errors and waste. Action analytics and solutions can tackle not only deliberate fraud but also unintentional errors, inefficiencies, and abnormal patterns and outliers.

## Healthcare Provider Analytics

Empowers the discovery of clinical insights and increases operational efficiency by bringing together data from any source into a high-performance data warehouse. Resulting in improving medical instrumentation automation, care delivery, provider real-time decision support across clinical, ambulatory, and areas of specialization with edge data processing and analytics.

## Care Delivery Provider and Patient Engagement

Offer products and services more intuitively, communicate more effectively, and engage more consistently with a 360-degree view across all your care delivery providers and their patient touch points.

## Modernize Healthcare Applications

Transform your legacy applications and data architectures into intelligent applications on modern cloud-based platforms, to increase ROI and leverage cloud, AI, mobile and IoT data.

## Data Governance for Healthcare

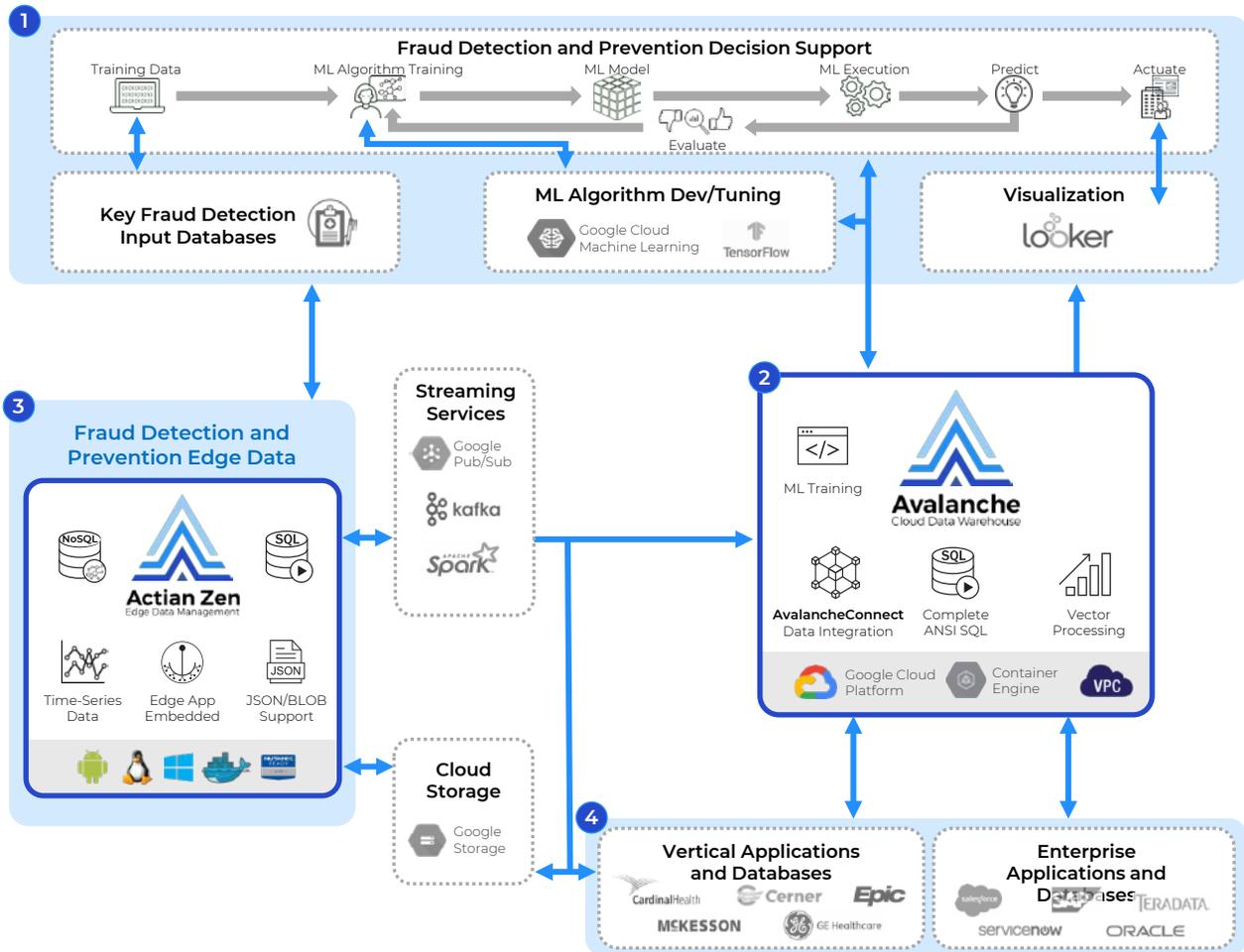
Arm your Chief Data Officer with transparent, timely, secure, and accurate data for regulatory compliance with CMS and other regulations, including data from high-risk areas of vulnerability, such as mobile and IoT.



“We selected Action to address our most demanding data analytics workloads. Avalanche offers the perfect combination of great analytics performance and the lowest total cost of ownership available in a cloud offering.”

– Chief Information Officer,  
Beacon Health Options, Inc.

# Healthcare Fraud Detection and Prevention



## Reference Architecture

### 1. Fraud Detection Patterns

Built-in support for traditional, new data sets and patterns for healthcare analysts with payers and providers.

### 2. Accelerated Health Analytics

Provides accelerated analytics across all major public and private clouds, bringing together data, regardless of source or type with low, predictable cost and superior price-performance.

### 3. Edge Data Management

Actian Zen provides scalable, secure, SQL and NoSQL data management that can be embedded in mobile, IoT, and other edge applications.

### 4. Built-in Data Integration

Build no-code data load and prep pipelines for healthcare-specific applications, IoT devices and streaming and batch data sources.

# IoT Powered Edge-to-Cloud Analytics

Edge applications and devices increasingly rely on complex data processing and analytics to improve automation and end-user decision support. The underlying cloud and edge data management solutions must be capable of leveraging a variety of hardware architectures, operating systems, communications interfaces, and languages. Actian Avalanche and Zen Edge Data Management provides broadest, highest performant and cost-effective duo for this demanding set of requirements.

## Intelligent and Integrated Automation

IT investments in manufacturing, aerospace and defense, communications, energy production and distribution will only achieve their full ROI potential with the combination of IoT, the cloud and AI-enabled distributed applications. Avalanche and Zen together provide platform independent data management and analytics solutions, embeddable in edge systems and devices with true edge to cloud connected analytics.

## Decision support at the point of action

Edge-to-cloud isn't just about machine to machine. AI-driven digital assistants will combine user-owned learnings and controlled information with scenario-based demographic and behavioral response data to personalize decision support at the point of action in everything from grocery shopping to pilot simulations.

## Grid management

Local and perimeter security defense, oversight and governance for sets of devices or human operations, software updates including AI models in unsupervised edge device operations will require tight

communication and collaboration between data management platforms and analytics systems from edge-to-cloud and back.

## Tracking and Tracing

Real-time data sharing and analysis across multiple parties with different systems, data stewardship, protocols, and legacy systems typifies many use cases ranging from transportation and logistics to communicable disease control. Avalanche and Zen combine to deliver the performance and data security across cloud and edge environments.

## Smart and Autonomous Vehicles

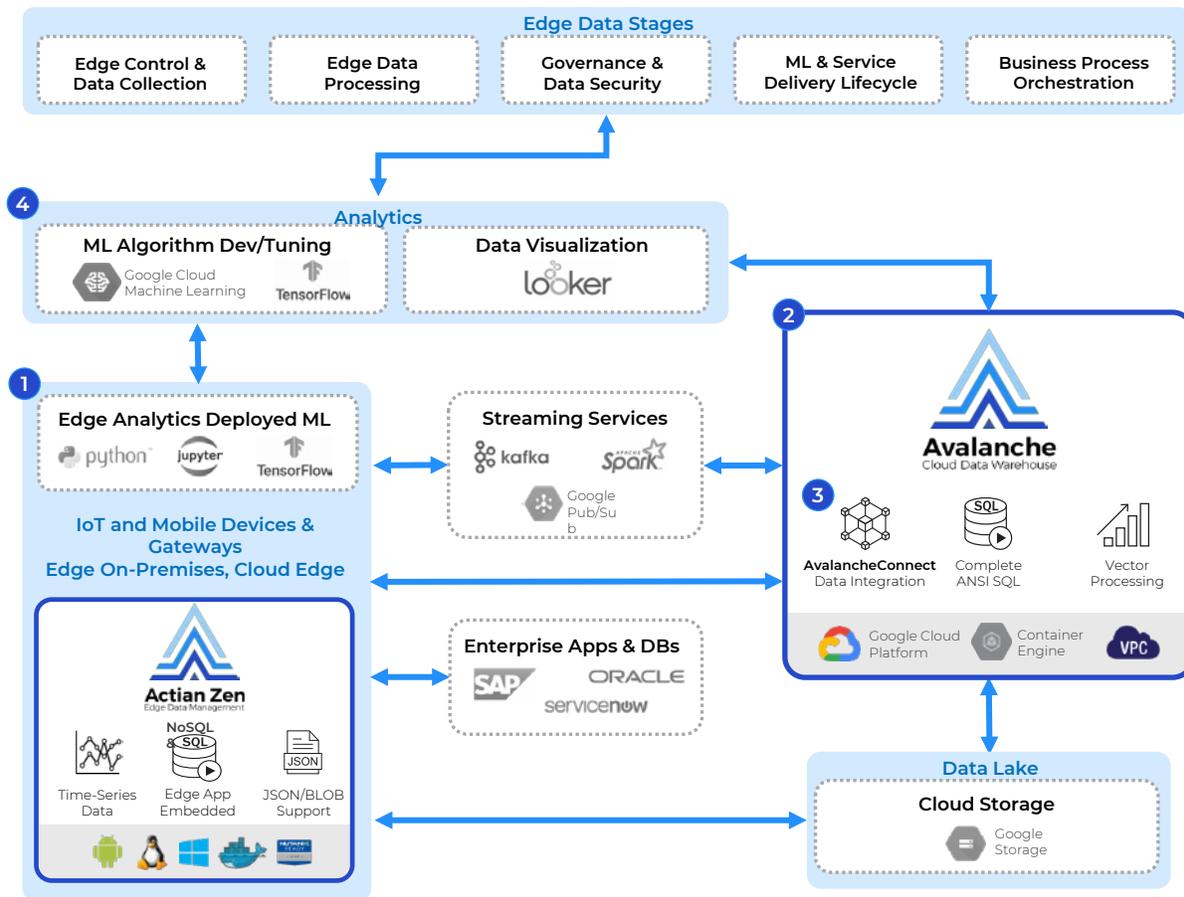
Airplanes, cars, high-speed rail, and other connected mobile equipment represents the most challenging set of requirements across automation, tracking, decision support, and grid management. From lidar signals processed with local unsupervised AI in self-driving cars, modelled and tuned in the cloud and paired with a Digital Twin, Avalanche and Zen combine as an edge-to-cloud data processing and analytics solution.



“With the evolution of the Zen architecture, we can now deploy a small footprint/IoT-enabled database that can run in a serverless mode with just client libraries. That opens up whole new opportunities for customers to put inexpensive IoT-enabled devices into settings that used to require expensive PLC devices.”

- Chris Okamuro, Vice President  
and Chief Technology Officer,  
Global Shop Solutions

# IoT Analytics Reference Architecture



## Reference Architecture

### 1. Edge to Cloud Processing

Action Zen provides scalable, secure, SQL and NoSQL data management that can be embedded in mobile, IoT, and other edge applications.

### 2. Real-time IoT Analytics

Action Avalanche Cloud Data Warehouse delivers superior price-performance delivering analytics for actionable insights in real-time.

### 3. Built-in Data Integration

Action AvalancheConnect includes drag-and-drop support for thousands of different applications and data sources.

### 4. Popular BI, Data Science Tools

Avalanche has built-in support for popular BI and Analytics libraries, visualization, and data science tools and platforms.

## ITOps Health and Security Analytics

Managing the health and security of IT infrastructure has become an increasingly intractable problem. With the explosion of ITOps, DevOps, AIOps and SecOps data streaming from multiple clouds, applications and on-premise platforms, many vendors are working to provide data visibility in their domains but fall short in creating a holistic view to predictively identify trouble spots, security risks and bottlenecks.

Action makes it possible to gain real-time actionable insight with a holistic IT analytics approach combining data from thousands of data sources into a unified hybrid-cloud data warehouse capable of near real-time analysis of applications, infrastructure, and security posture, reducing costs and accelerating response times.

### **Predictive Analytics for ITOps**

Aggregate your ITSM data to enrich predicted events and identify patterns bridging the gap between IT service management and IT operations. Analyze similar previous incidents, change requests and remediation actions to predict the probable incident priority, business impact and urgency – to focus on the most important incidents first and accelerate MTTR.

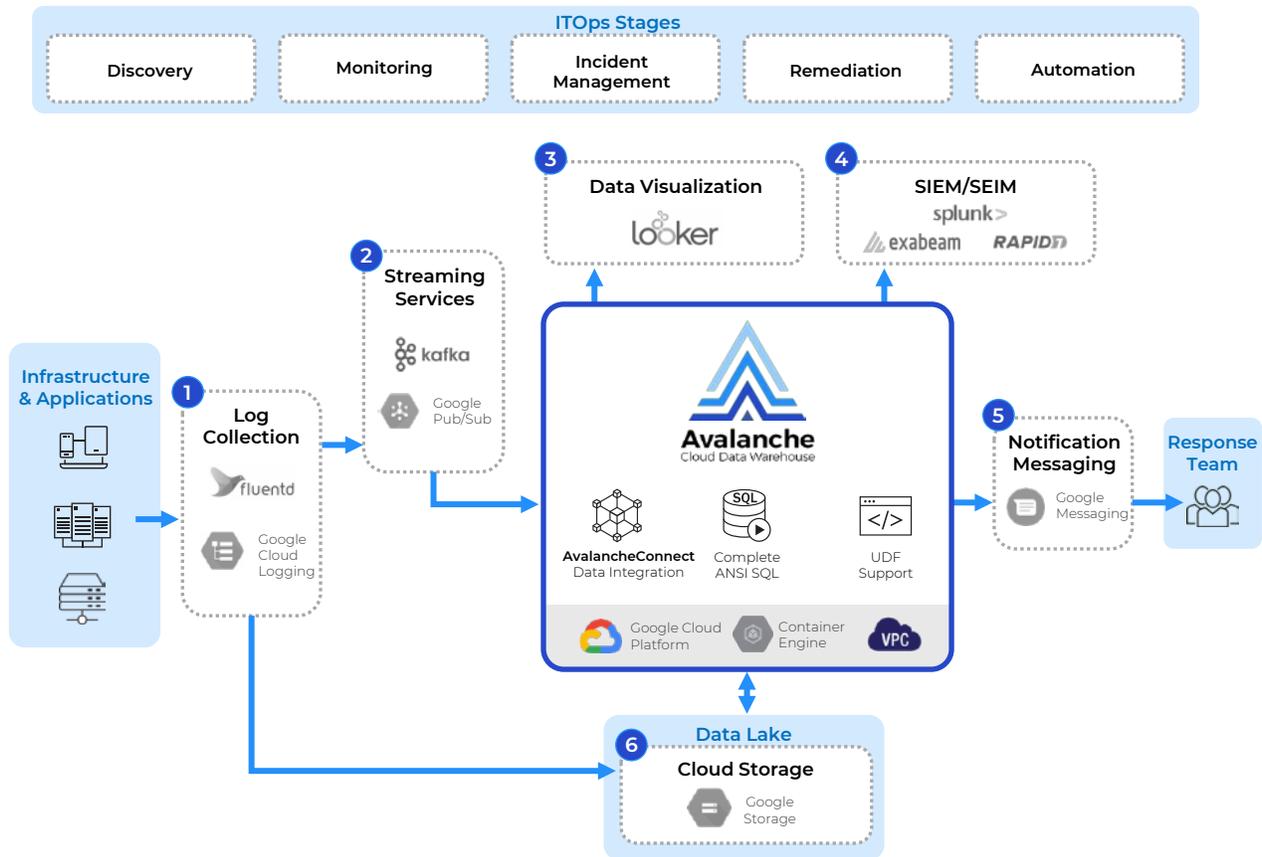
### **Security Incident Response**

SEIM/SIEM systems were not designed to handle the volume and variety of real-time data generated today. Pricing by data volume by many vendors prevents security teams from having visibility into high-volume data sources forcing CSOs and CIOs to put their security posture at risk or pay millions for their own data. Action Avalanche enables security teams to use one system to analyze data from all sources enabling faster identification and containment of incidents, at a lower cost.

### **Cyber Threat Forensics**

Following an attack, cyber forensics analysts collect, examine, and analyze all of the data from compromised systems, applications, infrastructure and devices along with contextual data and past patterns consistent with best-practices ensuring that any evidence could be admissible in a court of law. Action Avalanche provides a single system to aggregate, enrich and analyze forensics data.

# ITOps Health and Security Analytics



## Reference Architecture

- 1. Log Collection**  
 Collect log data from applications, systems and infrastructure for analysis.
- 2. Streaming Services**  
 Consolidate and pre-process log data through cloud streaming services. Ingest streaming data sources through AvalancheConnect.
- 3. Ad-hoc Analytics**  
 Connect a wide range of ad hoc query and analysis tools through JDBC to derive new insights.
- 4. SIEM/SEIM**  
 Connect chosen Security analytic tools to Avalanche for detailed security posture analysis, from multiple sources.
- 5. Notifications**  
 Create connections through Avalanche to key notification services.
- 6. Cloud Storage**  
 Direct storage of log files in cloud storage systems to be ingested into Avalanche.

# Supply Chain Analytics

Manufacturing today is a far more complex process, compared with just a few decades ago, with subcomponents required to assemble a single final product sourced from places all around the globe. Along with this complexity is a massive amount of data that needs to be analyzed to optimize supply chains, manage procurement, address distribution challenges, and predict needs while at the same time modeling and gaining insight in times of disruption.

Action is helping companies aggregate and analyze massive amounts of supply-chain data to apply data-driven insights optimizing supply-chain efficiency, reducing disruptions and increasing operating margins.



## Data Management and Automation

Gather insights around supplier performance, supply chain diagnostics, market intelligence and risk management through end-to-end information management, taking the form of data lake analytics to capture supply chain transactions accurately with high consistency and minimum redundancy while deriving patterns for optimization.

## Supply Chain Simulation

Model new supply chain strategies based on business and operating model changes, and current and future supply/demand/logistics constraints. Identify and validate the best cost-efficient network to achieve the necessary service level across the value chain.

## Intelligent Distribution and Logistics

Gain a more intelligent and responsive allocation across channels addressing challenges such as staffing, distributed warehouses, and direct distribution through real-time analytics.

## Intelligent Procurement

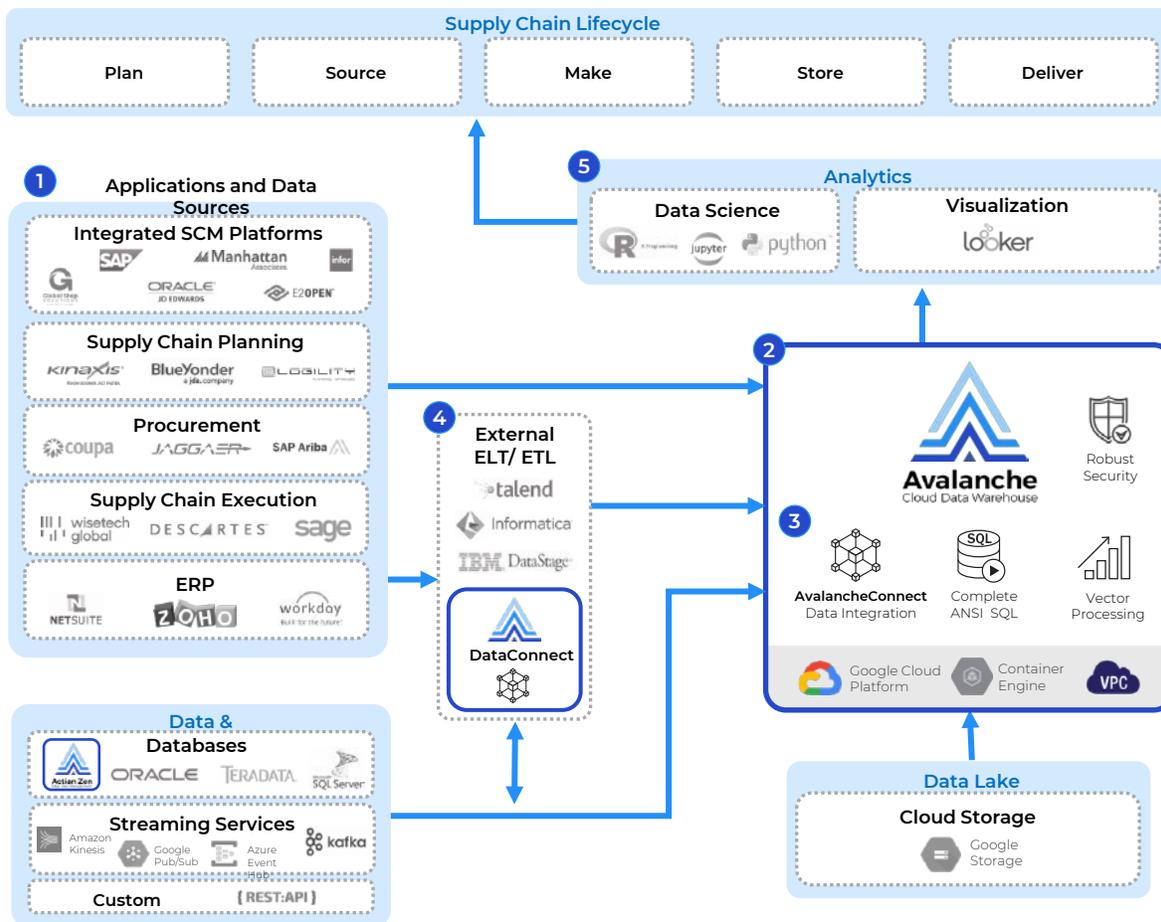
To help organizations understand where and when to source using advanced machine learning algorithms based on past purchases, commodity pricing, agro and industrial trends.

## Supply Chain Control Tower

Establish a single source of truth from sourcing to delivery for all trading partners to see and adapt to changing demand and supply scenarios across the world and resolving critical issues in real time.

3<sup>rd</sup> Party data sources were complicating and slowing down Mizuno's supply chain analytics for their JD Edwards ERP system. By moving to Action, Mizuno was able to get real-time data feeds, massively increasing efficiency of their supply chain which has had measurable impact on their bottom line.

# Supply Chain Optimization Analytics



## Reference Architecture

- 1. Supply Chain Data Lake**  
 Aggregate and enrich data from supply-chain applications and enterprise data across the lifecycle into a cloud data lake.
- 2. Optimize in Real-time**  
 Action Avalanche Cloud Data Warehouse delivers superior price-performance delivering analytics for actionable insights in real-time.
- 3. Built-in Data Integration**  
 Action AvalancheConnect, includes drag-and-drop support for thousands of different applications and data sources.
- 4. Leverage External ETL/ETL**  
 Connect existing data pipelines into Avalanche for aggregation and analysis.
- 5. Popular BI, Data Science Tools**  
 Avalanche has built-in support for popular BI and Analytics libraries, visualization, and data science tools and platforms.

# Machine Learning and Data Science

Actian's Avalanche cloud data warehouse and portfolio enables enterprise data science teams to collaborate across the full data lifecycle with immediate access to enterprise data pipelines, scalable compute resources, and access to preferred tools. In addition, streamline the process of getting analytic workloads into production and intelligently manage machine learning use cases across the business from the Edge to the Cloud.

With built-in data integration and data preparation for any streaming, edge or enterprise data source, aggregation of model data has never been easier. Combined with direct support for model training systems and tools and the ability to execute models directly within the data warehouse alongside the the data can capitalize on dynamic cloud scaling of analytics compute and storage resources.

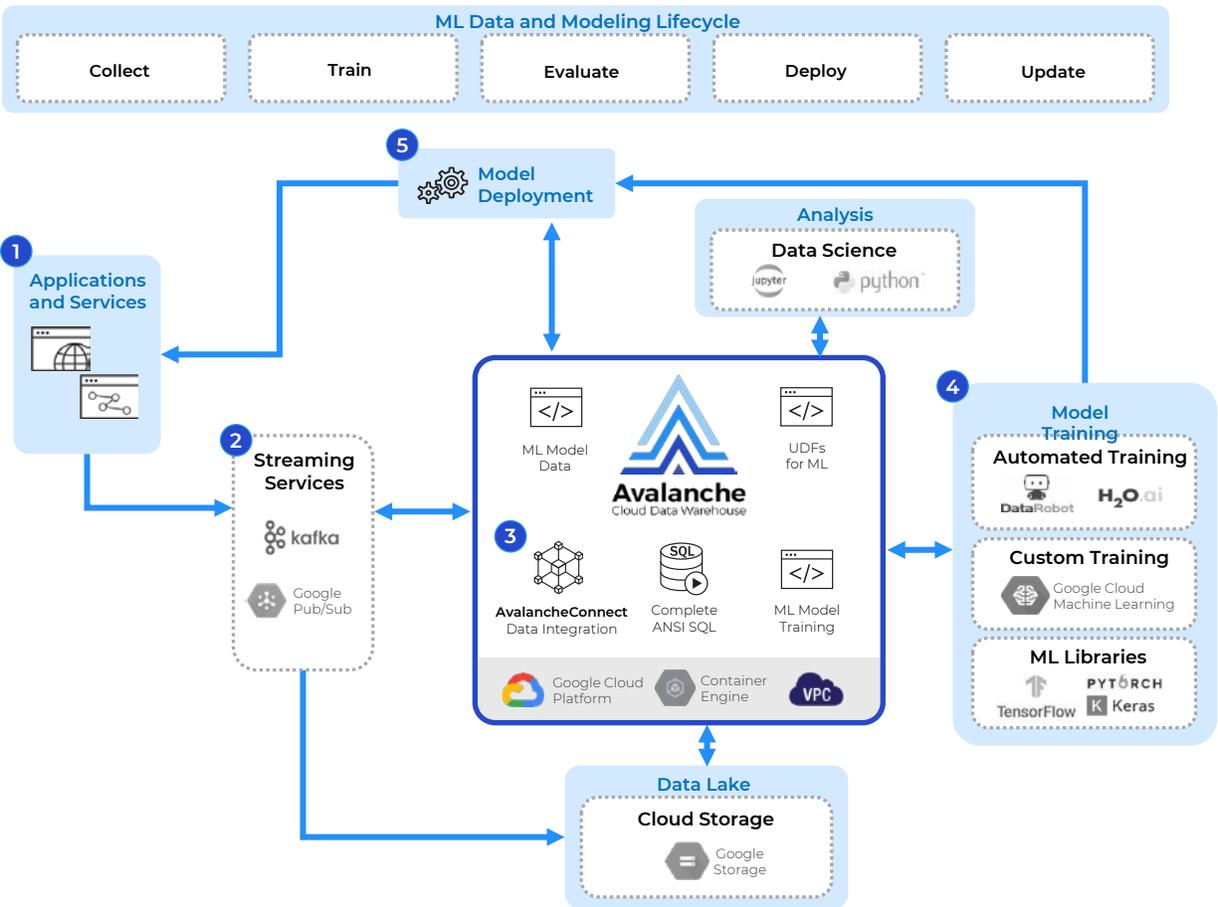
## **Simplify and Accelerate ML Model Training**

Model training demands large volumes of data be consolidated, processed and updated regularly to be effective in training predictive models. The goal for machine learning is to predict and anticipate the next action based on current and real-time data. The training datasets and models are in constant evolution requiring a cloud data platform that can aggregate and analyze in real-time to provide the latest data for the model to run against to achieve the predictive outcomes for the ML application. Actian's portfolio provides a complete Edge to Cloud solution.

## **Data Science Analytics**

Many times, data scientists are forced to wear multiple hats from data analysis, pipeline development and data stewardship. Actian's support for popular data science tools, including built-in drag-and drop data integration across streaming, batch and custom REST-based data sources, provides a flexible Edge to cloud platform that supports a wide range of data science use cases.

# Machine Learning and Data Science



## Reference Architecture

- 1. Collect Training Data**  
 Applications and services produce model training data either as a streaming source or deposited into cloud storage.
- 2. Aggregate Into Avalanche**  
 Consolidate and pre-process training data through streaming services into Avalanche.
- 3. Built-in Data Integration**  
 Actian AvalancheConnect includes drag-and-drop support for thousands of different applications and data sources.
- 4. Model Training**  
 Using data stored in Avalanche, Data Scientists and Engineers use Avalanche UDFs with C, Python, and Javascript as model training platforms and tools to create predictive models.
- 5. Model Execution**  
 Deploy models directly in Avalanche or applications accessing data directly in Avalanche or via streaming service for real-time predictions.



# About the Actian and Google partnership

## About Actian

Actian, the hybrid data management, analytics and integration company, delivers data as a competitive advantage to thousands of organizations worldwide. Through the deployment of innovative hybrid data products, fully managed cloud services, mobile and edge data management solutions, Actian ensures that business-critical systems can analyze, transact and connect at their very best – both on premise and in the cloud. Thousands of forward-thinking organizations around the globe trust Actian to help them solve their toughest data challenges to transform how they power their businesses with data. For more information, visit [www.actian.com](http://www.actian.com).

## About Google Cloud

Google Cloud provides organizations with leading infrastructure, platform capabilities and industry solutions. We deliver enterprise-grade cloud solutions that leverage Google's cutting-edge technology to help companies operate more efficiently and adapt to changing needs, giving customers a foundation for the future. Customers in more than 150 countries turn to Google Cloud as their trusted partner to solve their most critical business problems.

For more information, visit [www.actian.com/partners/google-cloud](http://www.actian.com/partners/google-cloud)