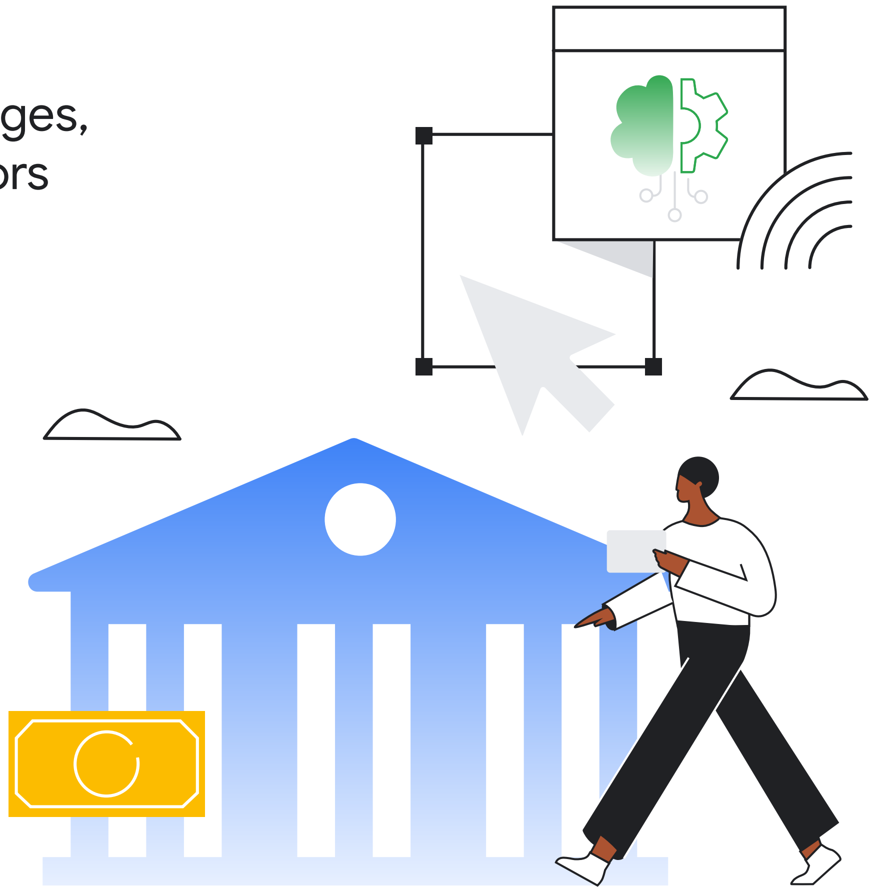
Google Cloud

Building the financial markets foundation for the future

Cloud and the markets:
opportunities for exchanges,
participants and regulators



Executive summary

From the trading pits of the past to the cloud of today, technology has always played a key role in driving ongoing growth and democratization of the financial markets. As the capital markets industry sees an increasing number of investable assets and significant growth in global liquidity, the exchanges that serve these markets need to ensure greater resiliency, accessibility, performance and security going forward. Increasingly, exchanges, participants and regulators are leveraging the cloud and related technologies to meet these new requirements.

Similar to the dynamics faced by media companies that are seeing an explosion in the number of global content creators and more direct access to global consumers through media streaming, the capital markets are transforming the way assets are created, data is analyzed, and participants trade. There are more assets, more exchanges, and more participants than at any time in history. As a result, it is more important than ever to provide transparency, connect with customers and be innovative to capture new markets and support next-generation asset classes.

From exchanges to market makers, the industry is rapidly expanding access to information and participant engagement. It is a race to drive better insights at greater speed and scale, provide new tools to operationalize risk, comply with regulatory requirements, and operate more efficiently and securely.

The critical driver for these accelerating requirements is that data and the cloud are changing the way data is published, delivered and consumed. Investors have always sought out deeper and faster access to actionable market data in real time. However, participants are still stitching together the data they need from a multitude of third parties.

> **Across all buy-side and sell-side users, 72% intend to consume public cloud-based market data services in the next 12 months.**
>
> Source:
> Coalition Greenwich and Google Cloud Study

Exchanges are increasingly realizing they can attract greater participation by leveraging the cloud to provide vast amounts of proprietary and third-party data sets to help predict correlated risks, improve collateral management, and support regulatory and transparency requirements. Exchanges are embracing their central role in the markets and becoming data hubs.

Data growth supports market growth in the cloud

Real-time market data, analytics and trade execution with global access patterns are proving to be the emerging modernization strategy for the capital markets industry. Exchanges are looking to shift from legacy data distribution infrastructures to new technologies that enable them to focus on building markets and participation through broader access to data.

The financial industry, including the buy-side, sell-side and even regulators, is on a journey to the cloud to achieve greater agility, resiliency and access to innovation. As a result, global cloud networks that simultaneously reach billions of users and support innovative financial industry customers are the ultimate gateway for disseminating information in new ways.

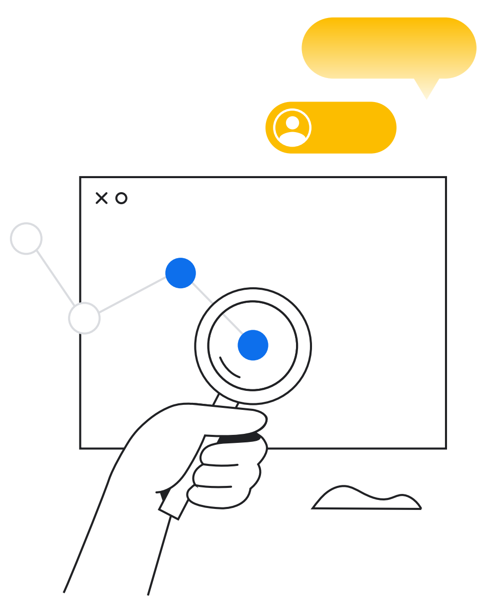
Organizations like CME Group recognized this and started its next generation infrastructure journey by migrating its data feeds to the cloud. Most recently, CME Group announced the migration of its entire technology infrastructure to Google Cloud including clearing and markets.

It is evident, though, that the cloud offers even more opportunities than just a broader customer base and more efficient data distribution:

Better decision making at scale

One of the most significant near-term benefits of democratization is increased market transparency and liquidity. There have been multiple efforts to provide audit trails, not just for regulatory purposes, but for high-fidelity backtesting as well. Few organizations have the infrastructure needed to support the petabytes of data required to achieve audit trails. Few organizations are able to provide real-time access to audit trails for market participants.

The sheer scale of the cloud vendors and their ability to handle exabytes of data presents new opportunities for exchanges to provide a near real-time CAT to their participants and their regulators, ultimately creating levels of transparency previously inconceivable.



Multi-asset analysis

Growing in importance is multi-asset class analysis as firms look to mitigate risk and explore new assets that deliver better returns. Major data providers to the financial markets are now providing their data in the cloud.

REFINITIV

Refinitiv launched its Tick History dataset on Google Cloud, enabling customers to access, query and analyze Refinitiv's extensive archive of pricing and trading data using the machine learning capabilities of Google Cloud BigQuery.

Learn more

Bloomberg

Bloomberg and Google Cloud are collaborating to provide mutual customers with cloud-native access to 35 million instruments, over 330 exchanges, and 80 billion ticks a day via Bloomberg's real-time market data feed, B-PIPE.

Learn more

Because these data providers are using a common infrastructure, the barrier to a centralized, multi-asset class view across markets, is quickly dropping. Firms no longer need to cobble together information from numerous proprietary providers and spend inordinate amounts of time on rote tasks like data extraction, transformation and loading. The market participants can instead focus on correlations of risks and information.

High performance

Democratization of information requires that it coexists with low-latency and high performance along with transparency and analytics. Going forward, the markets will demand more than just ultra-low latency and performance to solve historical obstacles to market access. The market will require streamlined order entry and optimized processes for pre- and post-trade flows with better insights to drive clearing, risk and settlement decisions. Most of the innovation in machine learning (ML) today is in the cloud because ML requires access to vast sums of data and vast farms of computing, two functions that the cloud excels at.

BNY MELLON

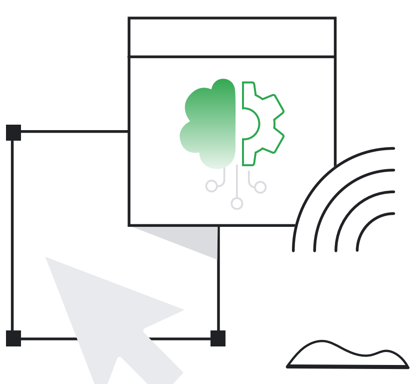
BNY Mellon is tapping Google Cloud's data analytics, artificial intelligence (AI) and ML technologies for an offering it claims could help clients forecast 40% of daily settlement failures, generate significant capital and liquidity savings, and unlock operational efficiencies. The bank is using Google Cloud for its scalable data analytics capabilities and to train models on millions of trades to consider every value and factor that could result in a failure.

Learn more

The foundation of the future

Beyond access to data and compute, the path forward for the new infrastructure that supports cloud-based markets is also gaining more clarity. Exchanges, participants and regulators are watching technologies like blockchain, cloud and ML and are reimagining what resiliency, accessibility, security, settlement and compliance will look like in the future.

The capital markets are becoming more global, 24/7 and interconnected with real-time trading and settlement services taking center stage. Exchanges like the CME Group are connecting their traditional end-of-day markets with these new 24/7 asset classes by launching CME Group CF Bitcoin Reference Rate New York and CME Group CF Ether-Dollar Reference Rate New York – which provides a real-time and once-a-day reference rate of the U.S. dollar for the two digital assets. Some next-generation online brokerage platforms are also launching 24/7 customer support.



Over the past few years, the exchanges have been executing roadmaps to support traditional technology demands for increased globalization, more scalable execution, faster settlement and clearing, better risk management and improved transparency. But a new set of technological requirements has rapidly emerged which includes around-the-clock, democratized market access, support for new asset classes, more sustainable energy to power computing, correlated analytics, and automated compliance. As an example of this movement taking place, some exchanges are acquiring cloud-based software firms that provide cross-asset trading and risk analytics solutions that also cover digital assets.

CME Group

CME Group is delivering access to market data for about 10% of the cost of traditional means, while offering a flexible on-demand, pay-as-you-go model and expanded global access.

Learn more

Technology has always been at the core of the best exchanges. In the same way a core group of exchanges rapidly adapted to algorithmic and machine-based trading in the 1990s, we are seeing the best exchanges (and market participants) evolve and innovate to support both the traditional and next generation of requirements. These exchanges are realizing they don't need to make large capital investments the way they did in the 1990s through 2010 to keep up. Instead, they are using the cloud for both traditional and new requirements, and as both the sandbox and production infrastructure to quickly launch and scale their new offerings. They are doing this at a fraction of the cost and time needed to build the previous market infrastructure.

When exchanges leverage the cloud, they get more than just a fast and scalable infrastructure. They see much faster network effects, and they increase liquidity for market participants. As their experiments become successful, exchanges are able to rapidly replicate and add new services with minimal investment.

Exchanges start with "low hanging fruit" priorities such as real-time market data, backtesting services and basic risk management services; then take on the more paradigmatic shifts like accelerated settlement, consolidated audit trails, industry-level risk management coordination, and high-frequency matching in the cloud. At each phase, they are able to depend on a consistent global platform which they can leverage to move into new global markets and provide mirrored services for new participants. More participants equal more liquidity.

Exchanges that undertake this journey may start with better data distribution, but they quickly realize that a strategic partnership with the cloud can create network effects that can supercharge their future business.

A roadmap of possibilities

Building a more accessible and secure market in the cloud is not only possible, it's happening now. As this market transformation takes shape, more challenges will need to be solved and work will need to be done. But with cloud networks and the democratization that is already happening in trading, market data and analytics, the potential to improve resilience and transparency across the trade lifecycle is profound.

Here are a few of the key functions and resulting advantages we see on the horizon.

Lower barriers to entry

Leveraging the cloud to launch exchanges and new products lowers the barriers for capital formation and increases the network effect for all market participants. Co-location's high cost of participation includes reliance on technical expertise to understand networking, custom hardware, and other bespoke components required to access the market. Imagine delivering access in a way that is more feature rich and cost-effective for all, from day one, globally for any experimental or production asset class.

Transparent regulatory reporting

Capital markets institutions want compliance and risk management solutions to efficiently fulfill regulatory requirements. Cloud can offer more seamless and secure connections between exchanges and regulators to ease transparency and information for regulatory reporting. While firms need a more efficient way to deliver on regular filings, modernization to cloud has the potential to benefit regulators by ensuring better compliance and more real-time access to regulatory data, while reducing the burden on filers to deliver standard information.

Event-based risk management

Cloud can also facilitate a risk management model that offers participants real-time insights by moving capital allocation decisions closer to actual market events. Streaming calculations and AI in the cloud would enable each market tick to update a set of portfolio investment parameters – giving firms a more concrete view of market risk and allowing for more efficient and effective capital deployment. In the end, there is less guessing and fewer buffers required to account for errors, delays, and manual processes.

Trading and localization in the cloud

The digital currency exchanges have created a new paradigm whereby trading engines in the cloud allow for foundational, localized, responsive experiences. This new paradigm stands to speed up onboarding and engagement, and increase liquidity for a wider global audience.

Reduced overhead, faster time to value

Traditional data ownership requiring proprietary infrastructures and knowledge of extracting, wrangling and storing data will soon be a thing of the past. Cloud will enable exchanges to reduce their operational overhead while generating new and faster, real-time revenue streams via a palette of scalable, cloud-native services that provide faster time to value for participants. Firms would be alleviated from the burden of expensive yet tactical IT management and freed to think strategically about their core business and launching new products and services.

The on-ramp to the markets of the future

The financial industry continues to make significant progress as exchanges, participants, regulators and technology providers collaborate to transform the markets, from traditional approaches to new paradigms that drive greater agility, resiliency and access to innovation.

The power of Google Cloud

- Secure-by-design
- Global infrastructure
- Embedded AI & ML
- Sustainable
- Hybrid & multicloud

To learn more or explore how Google Cloud fits into your long-term innovation roadmap, please contact your Google Cloud account manager or check our website:

Google Cloud for capital markets

Authors and contributors
We would like to thank Phil Moyer, Andre Mansour, Aaron Walters, Ryan Verlin and James Tromans for their help, support, and technical and domain expertise in writing this paper, as well as author Petra Kass, with many thanks to Behnaz Kibria and Daniel Gorfine for their valuable input and contributions.

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