

Charles River Software as a Service (SaaS)

A Managed Solution that Supports Critical Business Needs

Charles River deploys its investment management solution as a cloud-based service to help firms simplify and improve operations, increase user satisfaction and manage risk. The Charles River Investment Management Solution (Charles River IMS) brings together the right combination of capabilities, data, services and technology to help meet an investment firm's front and middle office requirements, both now and as its business evolves and grows. This simplified operating model includes:

Private Cloud-Based Application Management – Many firms are turning to the cloud in order to minimize complexity and reduce technology costs. Charles River helps firms support changing business needs, keep up with software upgrades, and ensure optimal application performance and reliability, by providing an easily scalable, fully managed, private cloud solution. Application specialists manage Charles River IMS according to best practices, and provide application and integration expertise that is difficult for firms to build and maintain in-house.

Integrated Data Services – Front office systems consume enormous quantities of data, and accuracy is essential to formulating and executing effective investment strategies. Charles River alleviates many of the challenges, complexities and cost of data management by integrating multiple data sources to provide more complete, accurate and timely data throughout the trade lifecycle.

Global FIX Network – Enabling traders to react quickly to market opportunities makes FIX connectivity one of the most critical integration points for the investment management platform. The growing complexity of FIX, increased multi-asset class support, and the use of algorithmic trading have made FIX administration increasingly difficult. Charles River's certified global FIX network is administered by an experienced global FIX team that manages, tests and certifies broker connectivity, ensuring seamless, reliable electronic trading.

Compliance Advisory Services – Ever-changing regulatory requirements are increasing the compliance workload at many firms, and expertise is in short supply. Charles River's Compliance Advisory Services extend the compliance organization to help ensure that workflows are efficient and rules keep pace with new mandates and specific regulations, including Dodd-Frank, UCITS, CESR, substantial shareholder disclosure regulations (SSDR) and more.

Charles River's Simplified Operating Model

Cloud-Based Delivery	Data Service	FIX Network	Compliance Advisory Services
<ul style="list-style-type: none"> Day-to-Day System Management Seamless Upgrades 24x7 Operations Support Third-party Integration & Interface Support Application & Database Performance Management 	<ul style="list-style-type: none"> Reference, Issuer, Price Data Real-time New Security Set-up Integrated Real-time Quotes Benchmarks Data Validation & Integration 	<ul style="list-style-type: none"> Certified Global FIX Network FIX Administration End-to-End Testing & Certification Intraday Monitoring Broker Onboarding Algo Validation 	<ul style="list-style-type: none"> Compliance Rule Advisory Rule Writing, Maintenance, Support Rule Library Review / Assessment Compliance Health Check Compliance as a Service

Fully managed deployment of Charles River IMS allows clients to leverage the economy of scale in Charles River's global support teams and the application expertise that comes from supporting a diverse client base.

Benefits

- Can improve user satisfaction
- Simplify day-to-day management
- Increase competitive value of investment applications
- Accelerate new product time to market
- Aims to lower operating costs



Charles River's SaaS solution is ISO 27001 security certified globally for Cloud-Based Application Management, Compliance Advisory Services, and the Charles River FIX Network.

Cloud-Based Delivery

Charles River combines private-cloud deployment with daily attention by application experts to help ensure proper configuration, increase standardization, and facilitate smoother and timelier software upgrades. Extensive support services include:

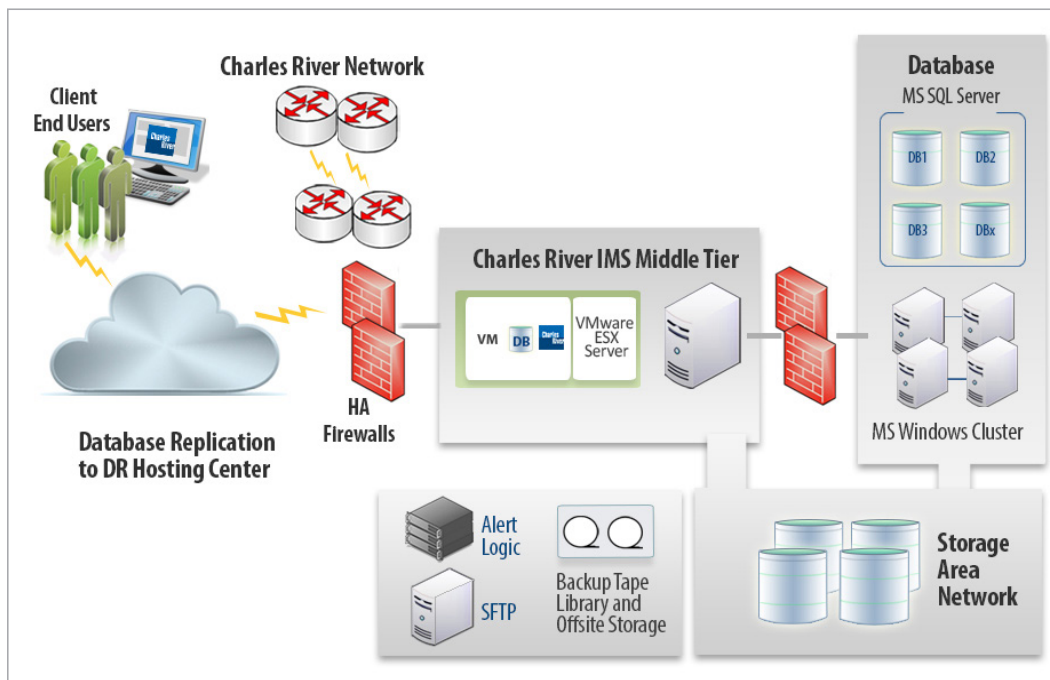
- Charles River IMS system administration, automated processing & interface support
- Timely implementation of software updates, including annual Charles River IMS technical upgrades
- Operating system installation, configuration, and routine and hot-fix patches
- Network connectivity options with full security monitoring, intrusion detection, anti-virus protection
- Scalable, high-performance servers and storage with MS SQL Server database
- Hardware and software monitoring/alerting, performance tuning, maintenance and support

Charles River's dedicated system specialists develop a deep understanding of each client and how Charles River IMS can meet their business needs. This close working relationship allows changes to be implemented more effectively and helps ensure that important new capabilities are not overlooked. Charles River also facilitates use of standard interfaces and works directly with interface counterparties to simplify integration. Our global "follow-the-sun" Application Specialist team assures round-the-clock support and expertise so problems are resolved more efficiently.

"It's been more cost-effective for us to go with experts who know the system well, and the managed approach works great for us."

IT Manager, Charles River client, large institutional asset manager

A Fully Managed, Private Cloud Environment



Charles River provides clients with a dedicated instance of Charles River IMS, hosted at premier SSAE 16 Type II-compliant hosting centers with connectivity to the Charles River FIX Network, stringent security and disaster recovery capabilities.

Data Service

The Charles River Data Service provides a single, cost-effective data feed for all asset classes. Data is aggregated from multiple sources and directly fed 'hand-in-glove' into the Charles River IMS across nearly a thousand data fields. It is an integral part of Charles River's private-cloud solution and is also available to legacy client-hosted environments. Our data management specialists manage the entire process, enabling clients to improve data quality and perform investment management functions more readily. Charles River coordinates with data vendors, manages interfaces, implements changes in feeds, adapts to new requirements, and facilitates smooth software upgrades. Data service specialists monitor and manage data feeds, 24 x 7 x 365.

Benefits

- Can improve data quality
- Improve decision support
- Provide timelier access to new data
- Stay current with vendor format changes
- Aims to reduce data integration costs

Reference Data and Real-Time Security Setup

Charles River provides timely delivery of validated security reference and issuer data for portfolio management, trading, compliance and risk management, including:

- Equity and fixed income identification & classification information, terms & conditions, plus fixed income ratings and bond schedules
- Issuer and entity relationship data
- New security setup in portfolio management and trading workflows
- Choice of data update schedule – intraday or a specific time period

Streaming Real-Time Data

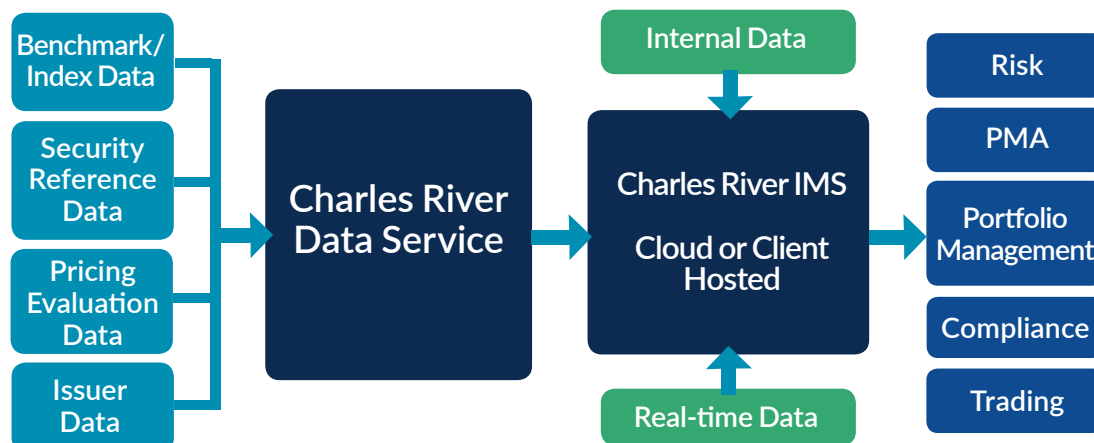
Charles River streams market data directly into the Charles River IMS, including pricing and market data for equities, futures, options and FX rates from over 135 exchanges worldwide, with:

- Price & data snapping across the order lifecycle
- Delayed or real-time streaming quotes
- Time and sales, including historical
- Price history for charting (e.g., intraday, week, month)
- Level II market depth

Constituent-Level Benchmark/Index Data

Charles River imports constituent-level data from major equity and fixed income benchmark families to support portfolio modeling and rebalancing, performance measurement, and compliance with:

- Timely validation and delivery of equity price, market cap, classification and daily returns; and fixed income price, classifications, ratings and analytics
- Category roll-ups based on industry classification, market cap, duration and other criteria
- Choice of market open and close data



A single, fully managed data source supplies data to a range of investment activities throughout the trade lifecycle.

Managed, Integrated FIX Network

The Charles River Network supports electronic trading via FIX to over 500 global liquidity venues including brokers, multi-broker trading venues, crossing networks, broker algorithms, program desks, dark pools, smart order routers, ECNs, and ATs. Full integration between the Charles River Network and Charles River IMS helps ensure fast and reliable direct access between Charles River clients, brokers and trading venues.

Charles River's FIX Administration team provides global, 24/7 support which simplifies network operation and eliminates the need for FIX network management by the client. Charles River's continuous testing and certification of brokers and trading venues on Charles River Network helps ensure seamless connectivity and the highest level of reliability.

Clients can choose to connect via dedicated telecommunications infrastructure or Internet VPN. The network supports FIX tags, translations, and other special sell-side requirements.

Charles River Network Advantages

- Broad asset class coverage
- Highly reliable — 99.999% uptime
- Seeks to avoid a single point of failure
- Aids in faster problem resolution

Compliance Advisory Services

Charles River's compliance specialists bring deep knowledge of regulatory bodies and have access to thousands of rules from numerous jurisdictions worldwide. Utilizing Charles River IMS's compliance software capability and comprehensive rule library, the service provides:

- Creation, testing and implementation of new and advanced rules, such as benchmark comparisons and derivative exposure rules
- On-boarding advice for new accounts and account maintenance
- Recommendations for data sourcing and managing data exceptions
- Rule testing and validation after software patches and upgrades
- Compliance best practices assessments

Compliance as a Service — Charles River also offers a standalone compliance solution in a fully managed, hosted environment utilizing the Charles River Data Service or client-provided reference and benchmark data. This turnkey solution enables clients to centralize compliance monitoring and automate compliance workflows while leveraging Charles River's compliance expertise, global support teams and established hosting centers.

Enhanced Support Services

To help ensure high end-user satisfaction and value for clients, Charles River offers a comprehensive set of support services designed to meet each firm's unique needs based on the environment, available resources, budget, and overall goals. Our approach is pragmatic and flexible, encompassing training, end-user support, on-site support, product knowledge and proven methodologies for successful deployment including:

- Workflow configuration
- Data management
- New instrument support
- Functional upgrades and testing



A State Street Company

ABOUT CHARLES RIVER

Charles River Development, a State Street Company, enables sound and efficient investing across all asset classes. Investment firms in more than 40 countries use Charles River IMS to manage more than US\$25 Trillion in assets in the institutional investment, wealth management and hedge fund industries. Our Software as a Service-based solution (SaaS) is designed to automate and simplify investment management on a single platform – from portfolio management and risk analytics through trading and post-trade settlement, with integrated compliance and managed data throughout. Headquartered in Burlington, Massachusetts, we support clients globally with more than 750 employees in 11 regional offices.

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