

BSE BUILDS WORLD'S FASTEST TRADING SYSTEM WITH RED HAT SOLUTION



SOFTWARE AND SERVICES

Red Hat® Enterprise Linux®

Red Hat Satellite

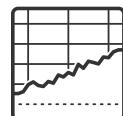
Red Hat Enterprise
MRG Realtime

Red Hat JBoss® Enterprise
Application Platform

Red Hat Consulting

Red Hat Technical
Account Manager

For two decades, BSE (formerly Bombay Stock Exchange Ltd.) struggled to meet business needs with proprietary technologies. The exchange could not innovate, and the high cost of upgrades made its system economically inefficient. The Indian stock exchange built a new trading system using open source technology from Red Hat, with help from Red Hat Consulting and a Red Hat Technical Account Manager. As a result, BSE has expanded from 10 million to 400 million orders per day, achieved the fastest trading speed in the world,¹ and reduced its total cost of ownership (TCO) by 90%.



FINANCIAL SERVICES

500 EMPLOYEES

“We have found the support from Red Hat to be exemplary. Whenever we need anything from them, they have given it. ... Red Hat is now our backbone. Our business cannot run if Red Hat is not there.”

ASHISHKUMAR CHAUHAN
CEO, BSE

BENEFITS

- Reduced trade transaction time from 10 milliseconds to 6 microseconds—faster than any stock exchange in the world
- Increased trading volume from 10 million to 400 million orders per day
- Reduced TCO by 90%
- Eliminated manual tasks, resulting in increased operational efficiency and reduced staffing requirements—from 15 to just 2 employees



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¹ economictimes.indiatimes.com/markets/stocks/news/bse-becomes-worlds-fastest-stock-exchange-ashishkumar-chauhan/articleshow/49342664.cms

"When I think of Red Hat, the first thing that comes to mind is trust. ... [W]henever we needed help, support was available. The more support we got, the more trust we had. And that's how the relationship has grown."

KERSI TAVADIA
CIO, BSE

OVERCOMING THE RESTRICTIONS OF A LEGACY TRADING SYSTEM

Established in 1875, BSE (formerly Bombay Stock Exchange Ltd.) is Asia's first stock exchange. Over 140 years, BSE has supported the growth of the Indian corporate sector by providing an efficient foundation for raising capital.

When BSE shifted from floor-based trading to an electronic trading system in 1995, it used proprietary hardware and software. For the next two decades, BSE was locked into using and investing in those technologies.

"We were more or less stuck," said Kersi Tavadia, chief information officer of BSE. "We could not break free. We could not innovate."

The proprietary solution created many challenges for BSE. The system's agility reached its limits just when the rapidly growing exchange needed it most, such as while enacting regulatory updates. In addition, limited scalability restricted throughput. As a result, BSE could not achieve the speed that traders demanded.

The solution also created budget issues for the exchange. Minor upgrades required major investment, and the additional high cost of maintenance quickly made the legacy system economically unfeasible.

"There was a point when investing further in the system did not make any sense because it wasn't helping us achieve the goals we want," said Tavadia. "So we needed to cut down the technology and use a totally fresh approach, rather than upgrade the same things again and again."

BUILDING AN OPEN SOURCE INFRASTRUCTURE WITH RED HAT

Tavadia and his team decided to take a bold step: Discard BSE's entire IT infrastructure and build a completely new trading system with open source technology.

"Google is using open source. Facebook is using it. Everyone else is using it, and that's why they're profitable," said Tavadia. "They're not spending resources on proprietary software and hardware. We knew we needed to go in that direction as well."

BSE knew of Red Hat's reputation as a leader in open source technology. The exchange conducted a cost-benefit analysis and quickly determined that Red Hat's products and services were extremely competitive options. BSE was also impressed with Red Hat's extensive partner ecosystem—particularly its strong relationships with a large number of hardware vendors.

To achieve the flexibility, agility, and scalability needed to meet business needs, BSE used Red Hat technology to implement a new trading system called BOLT Plus. This system is powered by Red Hat Enterprise MRG Realtime, a replacement kernel for Red Hat Enterprise Linux. Red Hat Enterprise Linux provides a modular design that divides the trading system into several independent, isolated components in different service domains. As a result, BSE can implement, maintain, and run these components independently, leading to improved flexibility, throughput, and capacity. In addition, each component is designed with redundancy for real-time failover, reducing system downtime due to errors or other issues.

As part of the new system, BSE also implemented Red Hat Satellite for system management, such as patching and configuration management, as well as regular system updates. Additionally, Red Hat JBoss Enterprise Application Platform offers BSE a fully certified Java™ EE platform for quickly developing and deploying applications.

To ensure a successful transition to the new system, BSE's IT teams engaged Red Hat Consulting and a Red Hat Technical Account Manager.

"We have found the support from Red Hat to be exemplary," said Ashishkumar Chauhan, chief executive officer of BSE. "Whenever we need anything from them, they have given it, even though our day-to-day operations go on practically around the clock. Red Hat is now our backbone. Our business cannot run if Red Hat is not there."

BECOMING A LEADING STOCK EXCHANGE

FASTER TRADING

Previously, BSE's response time was 10 milliseconds. The new trading system has reduced latency, helping BSE improve its response time to just 6 microseconds—more than 1,000 times faster than before. As a result, BSE is now the fastest stock exchange in the world, with speeds 10 times faster than the next fastest exchange.

"And we now have a path to get to nanoseconds in the next two or three years," said Tavadia.

IMPROVED SCALABILITY

With open source technology, BSE is no longer locked into one software vendor and can also use hardware from multiple vendors to scale easily.

Prior to implementing its new system, BSE averaged around 10 million orders per six-hour day. With the new system, the exchange has now scaled to an average of 400 million orders per day, with top performance reaching 600 million orders. The new system will also let BSE scale on demand to process higher volumes of orders in the future, as high-frequency computer trading becomes more prevalent.

LOWER COSTS

As a result of replacing its proprietary systems with open source technology from Red Hat, BSE has lowered its total cost of ownership by 90%. Eliminating hardware vendor lock-in by migrating to open source software has also let BSE reduce its hardware costs by 66%.

The exchange has also achieved greater operational efficiency by using IT talent and other resources more effectively, leading to additional savings. With the new system, a common IT talent pool can easily deploy, run, and maintain every component of the company's technology environment.

"We were able to cut manual activities substantially, so that tasks that once took four hours to accomplish now take less than one hour," Tavadia said. "Staffing requirements were reduced from 15 people to just 2 people. The cost savings we've achieved let us release new products and try new ways of doing things."

TRANSFORMING BUSINESS AND ENTERING NEW MARKETS

Before its switch to open source technology, BSE struggled to stay competitive. "We were losing market share. Our volumes were down," said Tavadia. "We would be extinct if we had not switched."

Instead, the company has transformed its business. With open source technology from Red Hat, BSE is able to evolve constantly to meet changing market demands. And when BSE moves the BOLT Plus system to the cloud, the help of Red Hat Consulting and a Red Hat Technical Account Manager will make the transition easier.



CUSTOMER CASE STUDY BSE builds world's fastest trading system with Red Hat solution

"We have become very agile," said Tavadia. "We're ready for the future. We're OK with any change because we know we can adapt."

The new system has also created new business opportunities for BSE. The exchange was previously not in the currency market, but after implementing Red Hat technology, it entered into currencies and now represents almost 50% of that market in India.

Innovation requires support from trusted technology, and BSE trusts Red Hat to help it continue to succeed. "When I think of Red Hat, the first thing that comes to mind is trust," said Tavadia. "We trusted them because we had seen their product. And whenever we needed help, support was available. The more support we got, the more trust we had. And that's how the relationship has grown."

ABOUT BSE

BSE Ltd. has facilitated the growth of the Indian corporate sector by providing it with an efficient platform for raising capital. More than 5,500 companies are listed on BSE, making it the world's largest exchange by members listed. The companies listed on BSE commanded a total market capitalization of US\$1.64 trillion as of September 2015. BSE is one of the world's leading exchanges (fifth-largest as of September 2015) by index options trading.

ABOUT RED HAT



Red Hat is the world's leading provider of open source software solutions, using a community-powered approach to provide reliable and high-performing cloud, Linux, middleware, storage, and virtualization technologies. Red Hat also offers award-winning support, training, and consulting services. As a connective hub in a global network of enterprises, partners, and open source communities, Red Hat helps create relevant, innovative technologies that liberate resources for growth and prepare customers for the future of IT.



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@redhatnews
linkedin.com/company/red-hat

NORTH AMERICA
1888 REDHAT1

**EUROPE, MIDDLE EAST,
AND AFRICA**
00800 7334 2835
europe@redhat.com

ASIA PACIFIC
+65 6490 4200
apac@redhat.com

LATIN AMERICA
+54 11 4329 7300
info-latam@redhat.com