

NETWORKING

Brocade Quality Management System

A company-wide commitment to quality and a culture of continuous improvement.

BROCADE

Throughout its history, Brocade® has maintained a solid commitment to ensuring the highest levels of quality in the design, manufacture, and testing of its products. Beginning with its award-winning portfolio of Storage Area Network (SAN) solutions, Brocade has provided industry-leading solutions that meet the most stringent quality requirements in the most demanding business environments. Brocade has extended these quality standards and processes to its IP-based networking products as well. As a result, today's organizations can be confident that all Brocade networking products meet the same rigorous quality standards that have made Brocade SAN solutions the industry leader.

The Brocade Quality Management System (QMS) is a holistic approach to quality that leverages the expertise, proven testing methodologies, and tools of engineering teams across Brocade to deliver the highest quality networking solutions. Every group within Brocade—from hardware designers and software developers to manufacturers—actively contributes to the quality process, helping to identify and eliminate potential quality issues early in the product lifecycle in order to deliver the most reliable and cost-effective solutions possible.

This paper describes how Brocade uses a comprehensive, best-practice approach to quality management in order to provide organizations with the most reliable networking solutions available. As a result, organizations can be confident that their Brocade solutions will provide a reliable foundation for their IT infrastructures—helping them save valuable time, money, and resources.

BROCADE QUALITY MANAGEMENT SYSTEM

The Brocade Quality Management System (QMS) supports the Brocade philosophy that quality is everyone's responsibility. Through this system, hardware designers, software developers, manufacturers, and support technicians form a quality value chain, working together to identify and resolve potential quality issues in new products. At the same time, this system provides Brocade with the information it needs to continuously improve its quality measures. (See Figure 1.)

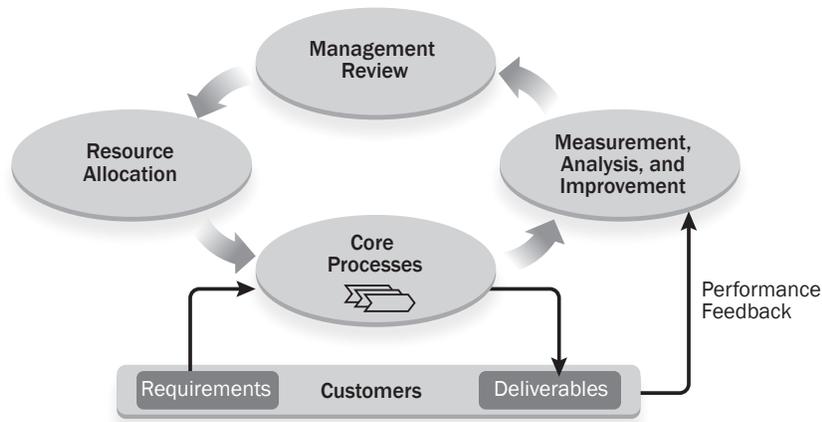


Figure 1.

The Brocade Quality Management System is designed to maximize the quality of products and services while driving continuous improvement.

At the forefront of any quality program is customer input, both in terms of requirements and expectations. As a result, customer input is a critical aspect of the Brocade QMS. By gathering and analyzing customer feedback—including performance data, enhancement requests, and suggestions—Brocade can work to ensure that its product and process objectives align with customer quality requirements.

Once product development begins, the Brocade QMS provides a quality workflow process spanning five key areas:

- Hardware design
- Software design and development
- Partner interoperability testing
- Manufacturing and operations
- Technical support

The holistic approach of the QMS allows Brocade to produce extremely complex networking products while still meeting the quality requirements of its customers.

ORGANIZED TO ENSURE HIGH LEVELS OF QUALITY

Brocade supports its commitment to high-quality hardware design with an organizational structure based on unrelenting focus and expertise. For example, the company has a Signal Integrity (SI) team that reviews and simulates critical, high-speed power distribution circuits to ensure high-quality design for every product under development.

Brocade also has invested in a large, in-house Printed Circuit Board (PCB) layout team to more effectively leverage existing designs and provide tighter integration among PCB, electrical, mechanical, and SI engineering teams. A dedicated sustaining engineering team helps maintain focus on both development and sustaining activities, further contributing to higher quality.

Ensuring High-Quality Hardware Design

Brocade engineers employ proven design techniques and a system of rigorous test and validation cycles to ensure the highest level of hardware quality. At the same time, they leverage existing product designs to minimize risks for potential quality issues.

Prior to release, all Brocade products undergo prototype, alpha, and beta development and testing. Brocade then validates products using industry-proven methodologies, including electrical Design Verification Test (DVT), mechanical DVT, thermal simulation and validation, and Highly Accelerated Life Test (HALT). The Brocade engineering team engages manufacturing teams early in the development process, during the prototype phase, to ensure manufacturing maturity prior to release.

Brocade also works closely with OEM partners to ensure that its products meet the stringent quality standards of the world's leading IT vendors.

Optimizing Software Quality at the Design and Development Stages

As part of the Brocade QMS, Brocade software design and development adhere to a disciplined quality framework that includes several testing phases as well as ongoing customer quality monitoring. The types of testing include:

Functional Verification Testing (FVT): During development, Brocade engineers test the code to identify potential quality issues in the architecture and resolve them at this early stage. Because FVT leverages automated testing methods, Brocade can efficiently verify that new features work properly and that legacy features still function correctly. In addition, Brocade automates the testing process to improve test coverage and increase the quality of the software code.

Software Quality Assurance (SQA) testing: This multi-phase, system-level testing focuses on functionality, reliability, availability, serviceability, performance, scalability, and manageability of the Brocade software product. Brocade shares SQA test plans and test results with its OEM partners as needed. The entire test process is designed to ensure project auditability.

Integrated OEM Fabric (IOF) tests: The Brocade software team performs IOF tests only on the final hardware, with test cases simulating a customer environment. By testing against all OEM storage and server equipment, and working closely with partners throughout the process, Brocade ensures that its engineers use the latest versions of all equipment, servers, operating systems, storage, and Host Bus Adapter (HBA) drivers.

Software sustaining Root Cause Analysis (RCA): The Brocade software sustaining team has defined a comprehensive RCA process to continuously drive quality improvements and minimize defect rates. By applying the RCA process to all fixes developed as a result of field escalations, the team can determine how a failure escaped Brocade testing. The software sustaining team then shares this knowledge with SQA engineers so they can make the appropriate test enhancements, and then with development engineers so they can prevent similar issues in the future.

Ensuring Manufacturing and Operations Quality

The Brocade manufacturing team plays a vital role in the QMS, working closely with the engineering team to meet stringent quality, reliability, and cost requirements. Although the top priority of the Brocade QMS is to remove any chance for product defects during the design phase, the manufacturing process also ensures that any defects introduced during product assembly (or by a purchased component variation) are removed—before the product ships to Brocade customers.

Brocade has created an extensive battery of tests and exercises to validate that products meet all design and operating specifications. In addition, as part of the company's commitment to continuous improvement, Brocade requires that all failures during the manufacturing test process (or reported by customers) be analyzed. The results are then used to improve overall design and supply chain vitality.

The manufacturing quality process facilitates collaboration not only between teams within Brocade, but also between Brocade and its partners. In this way, it unites various teams and testing processes at critical stages in the product lifecycle, helping to ensure quality in soon-to-be-released and future products. Leveraging a built-in system of checks and balances, the manufacturing quality process consists of the following key areas:

New product reliability: Brocade has invested in predictive processes and tools for new product development that enable the company to deliver unsurpassed product reliability. By using Destructive Physical Analysis (DPA), for example, Brocade can ensure that products are being built to Brocade specifications and help identify physical flaws that could lead to a failure. The Brocade reliability team also provides analysis of actual product reliability metrics, helping Brocade customers accurately forecast service costs associated with product ownership over time.

New Product Introduction (NPI) engineering: The Brocade operations team works closely with development engineering to streamline design and increase quality. This collaboration enables better test coverage earlier in the life of the product. By investing in tools that promote deep analysis and continuous improvement, Brocade has created a data-driven new product introduction environment that relies upon comprehensive manufacturing test development. In addition, Brocade partners with top-tier contract manufacturers who are equally committed to process development and validation, and who use industry-standard testing tools and methodologies.

Field data analysis: Brocade interlinks process development and validation to drive continuous process and product improvements. The Ongoing Reliability Test (ORT) and field performance monitoring not only confirm how well Brocade products are performing against the original reliability predictions, but also verify that Environmental Stress Screening (ESS) and run-in testing are effectively removing any product quality issues.

Failure analysis: The Brocade failure analysis process is tightly integrated with operations and hardware and software engineering to identify and swiftly act on trends. When a product is submitted for failure analysis, Brocade performs the necessary testing to duplicate the customer-reported issue and to verify that manufacturing test suites and system diagnostics are capable of accurately identifying the issue. Depending on the results of the failure analysis, Brocade will follow up with manufacturing operations, the supply base, or development engineering to remove the root cause of the problem.

Operations sustaining engineering: The operations sustaining engineering team manages the end-to-end process within the factory, taking both corrective and preventive actions when notified of field failures. This team also works closely with development and NPI engineering to identify the root cause of issues found in the field and to address these issues to prevent future problems. The sustaining engineering team leverages ongoing experience from the field to identify opportunities to continue increasing product reliability.

Technical Support –Investing in Quality Processes, People, and Partnerships

By leveraging best practices and fostering a culture of continuous improvement, Brocade can offer high-quality technical support throughout its eight Technical Support Centers, 170 parts depots, and 12 interoperability and testing labs.

To provide high-quality technical support for its networking solutions, Brocade invests heavily in its processes, people, and partnerships. For instance, Brocade regularly assesses its support organization by gathering customer feedback on delivery quality, processes, systems, products, and offerings. In addition, Brocade leverages a third party to gather unbiased customer feedback, satisfaction ratings, and statistics that help drive ongoing improvement within the Brocade Global Services organization.

The Brocade technical support team also receives ongoing training and certification in order to provide customers with the most skilled team to address their issues. As a result, Brocade customer satisfaction ratings continue to exceed industry expectations in all areas, including:

- Customer feedback: Brocade technical support has a customer feedback rating of 4.6 (on a scale of 1 to 5).
- Issue resolution: Brocade technical support resolves 99 percent of issues without the engineering team.
- Call response: Ninety percent of Brocade technical support calls are answered within 25 seconds.
- Abandon rate: The abandon rate (customers hanging up) is less than one percent for Brocade technical support.

In addition, Brocade uses quarterly business reviews with partners to identify improvement areas. In turn, Brocade partners can leverage ongoing Brocade training and certifications to gain the maximum level of technical proficiency to ensure that joint customers receive the highest possible levels of support.

SUMMARY

Driven by its ongoing commitment to quality, Brocade has invested in the expertise, processes, and tools to support a comprehensive approach to quality assurance. The Brocade Quality Management System (QMS) spans hardware design, software development, manufacturing and operations, and technical support to provide an integrated approach to quality assurance.

Based on best practices and years of industry experience, the Brocade QMS provides an efficient quality workflow for every Brocade networking product, at every stage of its life. More important, the QMS allows Brocade to provide customers with confidence in their networking solutions, knowing that they are using products that have met the most rigorous quality standards in the industry.

For more information about Brocade solutions, visit www.brocade.com.

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