



Cisco Autotest Transforms Quality Assurance for Global Manufacturing

Network-enabled application enables Cisco's value chain with automated testing, monitoring, and quality assurance

Executive Summary

Cisco

- Industry: Computing Technologies
- Location: San Jose, CA
- Number of Employees: 65,545

Business Challenge

- Help ensure highest quality of products created by multiple third parties
- Maintain consistency of products in geographically diverse locations
- Measure, control, and test for quality assurance

Business Results

- Processing 10.3 million records per day, as database grows 20+ percent year over year
- Four times the number of different products, while staffing remains steady
- ISBU yields improved by 13.2 percent; CRS by 13.4 percent

Network Solution

- Expansion of Autotest as company-wide quality assurance platform
- 3,000+ networked nodes provide visibility to manufacturing teams
- Complete performance monitoring across the supply chain

Business Challenge

Cisco is a world leader in the development of networking, collaboration, and virtualization hardware and solutions, manufacturing thousands of different routers, switches, appliances, IP telephones, video devices, interfaces, gateways, and other technologies to generate, including services, about \$40 billion in annual sales. Its products are built by contract manufacturers (CMs) at more than 30 manufacturing sites in North America, Europe, and Asia. These electronics manufacturing services (EMS) partners assemble over 35,000 stocking units (SKUs) from components with 77,000 unique part numbers across over 1,000 different suppliers. The company achieves this diversity and excellent inventory turns of 11.8 (cost of goods sold/inventory) by relying on Autotest, a comprehensive test development platform.

"We have a number of outstanding EMS partners with the facilities to do the work," says Vikram Sharma, Engineering Manager for Autotest. "But we were challenged to ensure that the quality of a product built by third parties located across a widely

distributed area, is the same or better than what we could have built ourselves. At any given moment, we might have hundreds of products being manufactured in many different locations around the world."

To measure, test, control, and help ensure the consistent quality of every product, Cisco set the goal of creating a mechanism for repeatable and global quality management with remote and real-time monitoring capabilities—one that would provide a closed loop manufacturing processes and support supply chain efficiency.

Solution

Originally developed as a test platform in the 1990s, Autotest is an innovative, internally developed platform that leverages Cisco® networking expertise to help ensure smooth execution throughout a large and complex supply chain. Today, this worldwide solution utilizes Cisco networking technologies and systems architecture to track everything from initial testing and licensing to production status, compliance management, component traceability, and anti-counterfeit protection.

Currently, Autotest is deployed across all Cisco manufacturing and repair facilities around the world—from San Jose to Penang—including development, production, configuration, contract repair, and remarketing facilities. More than 3,000 nodes are networked and

“Cisco’s Autotest capability enables our value chain to better collaborate, in real time, with our contract manufacturing partners in order to deliver quality customer excellence. This innovative test architecture provides a critical network for us. The consistent application of the Autotest platform is a key differentiator for Cisco, and is contributing to helping us achieve end-to-end value chain performance.”

—Angel Mendez, SVP,
Customer Value Chain Management

visible to Cisco’s manufacturing teams, collecting three million test records for 150,000 serial numbers every day. This wide array of information supports complete performance monitoring across the supply chain, including component suppliers, contract PCB assembly, final assembly test, and shipment to customers. Autotest is also deployed across the Cisco product spectrum, from IP Phones to Carrier Routing System (CRS) routers.

To accomplish these goals, Autotest offers:

- Powerful standardized test development and distributed operational platform, including shop floor process controls
- Interface with all major enterprise resource planning (ERP) systems for customer configuration management, helping ensure that items are shipped exactly as ordered
- Country-of-origin labeling and ship readiness to comply with government regulations.
- Anti-counterfeit and brand protection management to help ensure shipping of genuine Cisco products to customers

Software licensing management and remote, automatic provisioning of device certificates

- Automatic provisioning of MAC addresses for each production serial number
- Automated device firmware provisioning and management
- Component traceability
- Data collection/transfer engine
- Comprehensive reporting

As a mission-critical enterprise platform, Autotest manages daily detailed operations in real time, accessing activity-based reports or custom tools to gather information. At the prototyping phase, the application also helps to ready each item for production based on interactive, collaborative development of manufacturing processes. Based on an industry-standard services oriented architecture (SOA), Autotest scales up to support large and complex implementations, such as the manufacturing of the Cisco CRX1 enterprise-class router.

All these activities are supported by QDI, an enterprise business intelligence framework for quality, a cross-functional system encompassing multiple subject areas. This is used for strategic reporting on trends, linkage and predictive analysis, and reviews of day-to-day operations for process improvements and closed loop actions. It also allows Cisco engineers to assess the quality of their suppliers, with a fully automated test sequence, instrument control, and verification to gather and analyze diagnostics (digital), parametric (analog), structural, and function testing information.

“With the ability to automatically collect and analyze information, we can monitor status, debug problems, perform complete quality assurance, and resolve incidents while sitting in our office chairs in San Jose—we can even start and stop test operations on the production line from halfway around the world,” says Ravi Iyer, senior manager, Autotest. “With this unique, centralized system, Cisco is able to maintain the quality of all of our products at an extremely high level.”

Results

Cisco Autotest remains unique within the manufacturing industry, and has played an important role in the company’s success. Over a period of five years (2004 to 2009), the number of control points in the production process has doubled, the number of different products increased by a factor of four, the volume of products has seen a significant increase—while the number of production test engineers remained the same. Over the same time period, Cisco products have improved its yields by 13.2 percent, and the Carrier Routing System (CRS) by 13.4 percent.

Whenever new EMS partners are brought into the Cisco ecosystem, they are impressed by its design, automation, scalability and management for test and quality control. New EMS partner users generally find that they are comfortable with the system in about a day; while engineers can get up to speed within a few weeks.

Autotest currently generates 10.3 million records per day, in a very large database (3.5 TB) growing at more than 20+ percent year over year. In addition, the Autotest team is able gather the data needed for their Six Sigma teams to become increasingly effective. As a result, manufacturing defects have been lowered, providing improved yields at all phases of manufacturing, as well as decreasing the number of customer returns. With higher yields, deliveries are as expected and buffer stock is lowered. This capability allows Cisco to achieve its high inventory turns.

Perhaps one of the most astonishing aspects of Autotest's success is that it overseen by a team of just 25 engineers. Thanks to Autotest's high level of automation, this one small team manages the manufacturing test and quality control platform for the company.

Next Steps

For the future, Cisco plans to continue extending the Autotest implementation via the Internet to external original equipment manufacturers (OEMs), original design manufacturers (ODM) partners, and component suppliers, while improving its backend architecture with new blade-based Cisco Unified Computing System™ (UCS) technologies. This services-based infrastructure will accelerate deployment of new capabilities to help make the solution become even more scalable.

This transformative endeavour, called "Cesium," will require installing a Cesium Managed Server at partner sites that will integrate into partner backend systems. The core of Cesium platform is focused on security and identity management, which will help in communication and collaboration, all the way from the design process through manufacturing.

"The project is likely to set a new best practices standard for electronics manufacturers who are under increasing regulatory and customer-generated pressure to quickly track and fix quality problems and to document the testing of all systems and parts," said Jeff Moad, Editor of Managing Automation.

"Autotest helps deliver on quality, impacting all aspects of how we work and fulfilling our company vision to manufacture our products in a globally outsourced partner environment," says Iyer. "It is a great example of how Cisco is about leading the experience, and even as market conditions change, this platform raises the bar for how manufacturers learn from ongoing experience and act on that knowledge."

"First there was a dark, far-away factory," Sharma agreed. "And then there was Autotest."

For more information about, please visit www.cisco.com/go/manufacturing or contact a Cisco representative.



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