



Case Study

Motorola: Building Highly Reliable Next Generation Wireless Infrastructure

By collaborating with GoAhead® and leveraging the GoAhead SelfReliant® technology, our high availability platform initiative was able to meet our critical customer requirements while investing in a common framework which will return more with each future implementation.

- Bruce Stone, Senior Vice President, CDMA Systems Division, Motorola

KEY FACTS

Company

Motorola GTSS (Global Telecom Solutions Sector)

Industry/Market

Wireless

Challenge

- Develop an application-ready, high availability platform for re-use across multiple GTSS products

Payback

- Leveraged commercial, off-the-shelf middleware to save roughly 70 man years of development effort.
- Created robust, yet modular common platform, reducing new platform development effort by approximately 50%

OVERVIEW

Motorola's GTSS (Global Telecom Solutions Sector) business unit is responsible for building and selling Motorola network infrastructure products that meet the needs of the world's largest and most advanced service providers.

In mid-2000, the GTSS management team made a bold decision to implement an entirely new product development strategy. Rather than building a different hardware and software platform for each GTSS product, they decided to develop a new, application-ready, high availability platform called HAP that could be used as a common platform for multiple GTSS products. Motorola set ambitious goals for HAP: provide 5-nines availability; reuse hardware and software components, accelerate the development effort, shorten time-to-market; and reduce costs.

One of Motorola's first groups to adopt the HAP solution was the GTSS product team responsible for their CDMA Selection Distributor Unit (SDU) product. GTSS's CDMA SDU product is the first to be deployed using GoAhead's SelfReliant 2.0. It is a fully integrated, backward-compatible solution that introduces Internet Protocol (IP) transport into wireless networks, delivering an increase over IS-95A/B voice capacity, as well as data rates up to 144 Kbps. The Motorola CDMA SDU solution allows service providers to leverage their existing technologies while enabling a smooth, strategic transition to 3G.

MOTOROLA'S CHALLENGE

The SDU project, based on HAP, had the following business and technical needs:

1. Use commercial, off-the-shelf high availability middleware to reduce project risk
2. Ensure SDU meets Motorola's customers' requirements for availability by eliminating single points of failure for launch customers Verizon and Sprint
3. Accelerate time-to-market by providing a fully redundant common platform in which applications could be integrated easily and field trial commitments met
4. Reuse hardware and software components
5. Lower development effort and costs
6. Reduce manufacturing, procurement and maintenance costs
7. Meet project teams' stringent performance requirements

AVAILABILITY MANAGEMENT SOLUTION

Motorola considered a number of options for the high availability middleware component of HAP, including development of a proprietary internal solution and choosing a commercial-off-the-shelf (COTS) product. Motorola selected SelfReliant as their standard middleware solution for HAP. To bring the CDMA SDU product to field trials and commercial deployment as quickly as possible in the most cost effective manner, Motorola capitalized on all of SelfReliant's integrated features and functionality.

A total of over 150 GTSS engineers were trained in the use of the SelfReliant software development kit to take advantage of SelfReliant's powerful feature set. These engineers were members of the team developing the core hardware and software platform for HAP and primarily used WindRiver's Tornado development tools.

TECHNICAL REQUIREMENTS

In this implementation, SelfReliant met all of Motorola's technical requirements, including the following:

- Overall availability of system and applications
- Performance metrics:
 - 32+ nodes
 - 500 object transitions p/second
 - 10,000 managed objects per cluster
 - <5% CPU usage
 - >4,000 messages/second/node based on mutually developed benchmark tests
 - Memory footprint of 3.6MB or less
 - <3 second fail over for 4 node, 4000 object configuration
- Full life cycle support services:
 - Bug isolation, tracking, and resolution
 - Release and configuration management
 - Use case analysis and consulting
 - Test case validation

- Motorola development team training
- Cross platform environment: VxWorks and Linux
- Remote management capability
 - SNMP support
 - SelfReliant web-based console

MOTOROLA'S USE OF SELFRELIANT

The specific features utilized within SelfReliant's framework to meet these requirements can be divided into four primary functional areas:

High Availability Features - (Availability Management and Cluster Management)

Motorola uses SelfReliant's Availability Management Service (AMS) and the System Model and state matrix to reflect the various resources that require availability management and their possible state changes. A fully loaded SDU system consists of approximately 130 managed objects that are under availability management. Remote adaptors are used to discover and control application resources. A remote adaptor proxy is used to manage the hardware integration via Motorola's hardware PMI (Platform Management Interface). Motorola leverages a two-node cluster running in an active/standby configuration. They also deploy the Redundant Management NIC features provided by Cluster Management Services (CMS).

SNMP Agent

Motorola uses the SelfReliant SNMP agent to report system information to their OMC management console.

Database and Messaging

Motorola uses SelfReliant's Distributed Messaging Service (DMS) for checkpointing and SelfReliant notifications (e.g., NIC failure). They also use SelfReliant's in-memory database to store configuration management data as well as system statistics and other information. Motorola has abstracted the database interface so their customers, the service providers, are shielded from database specifics such as database, table, and row values. Databases are replicated and persisted.

Console and Trace

The SelfReliant Console is used to troubleshoot issues during the development phase. The Console is also shipped with the HAP software and is therefore available on any deployed system in a carrier environment. The Trace System is used to capture key GoAhead trace data. In a production environment, Trace is generated for important SelfReliant Process activities and error information. When the file reaches a certain size, it is backed up and a new Trace file is started.

Customer Service and Support

Throughout the project, Motorola HAP leveraged GoAhead's Client Services organization for professional customer service and support. With every key SelfReliant delivery, the Client Services organization provided onsite, night, and weekend troubleshooting services;

escalation management; emergency repair services and change control management. GoAhead also provided a train-the-trainer education model by which several hundred Motorola HAP engineers became well versed in the use and application of GoAhead SelfReliant.

CUSTOMER PAYBACK

Motorola's innovative approach to development of the High Availability Platform and its first implementation, the CDMA SDU product, returned both business and technical benefits.

Business Payback

1. Overall, Motorola saved approximately 70 staff years of development effort.
2. Using a COTS approach, Motorola re-allocated development team members to other value-added features and projects.
3. Motorola estimates that as much as 50% of new platform development is O&M framework functionality. The HAP common platform provides this functionality to project teams directly. The HAP platform provides a common, consistent management interface to the Network Element Manager, avoiding the product specific solutions created by project teams.

Technical Payback

1. Motorola conducted extensive testing, under heavy load, to prove failover performance
2. The SDU project represents a system with call preservation capability at its first product release
3. Motorola was able to offer a reliable, stable platform using a COTS middleware approach. Motorola is awaiting field results but believes that the availability goals for the initial release have been met.

SUMMARY

Overall, the CDMA SDU implementation of the HAP project represents a highly successful implementation of SelfReliant 7500. In this effort GoAhead worked with Motorola to train and support over 150 developers and enabled Motorola to achieve a faster time to field trials and commercial deployment. SelfReliant's comprehensive feature set allowed Motorola to re-allocate developers to other value-added projects and save many years of development effort. Motorola is currently working towards applying HAP on additional products, thereby expanding Motorola's packet based solutions based on the common High Availability Platform.