The critical importance of shelf management in AdvancedTCA

By Frank Fitzgerald

AdvancedTCA (part of the PICMG 3.0 family of specs) is rapidly becoming the standard for carrier-grade systems and other mission-critical operations. AdvancedTCA provides a powerful and flexible architecture for delivering next generation telecommunication services while satisfying the rigorous reliability, availability, and serviceability requirements of the Central Office environment.

By enabling the use of interchangeable off-the-shelf components, AdvancedTCA gives service providers and manufacturers the ability to select the best available options to achieve an optimal combination of features, performance, and price, along with the ability to more easily and cost-effectively upgrade and maintain systems in the future. The AdvancedTCA open architecture also allows equipment vendors and system integrators to essentially outsource the development and support of many components and subsystems in order to focus on core competencies and value-added customer solutions.

Integrated shelf management

One of the fundamental challenges for AdvancedTCA, as with any open architecture, is to provide flexibility and interchangeability without compromising on high-availability and other critical Operations, Administration, Maintenance, and Provisioning (OAM&P) requirements. AdvancedTCA aims to support capabilities like hot pluggability and automatic fail-over while minimizing or eliminating downtime.

One of the key ways that AdvancedTCA addresses this challenge is through a sophisticated and robust integrated shelf management system. Often considered to simply be a feature of the shelf, the Shelf Manager has become a critical and complex subsystem in AdvancedTCA and requires careful integration, configuration, and interoperability testing on the part of the shelf supplier.

The shelf supplier plays a central role in the implementation of an AdvancedTCA shelf management system by integrating and configuring the firmware and hardware from one Shelf Manager firmware and hardware vendors such as Intel and Pigeon Point Systems.

To achieve the full benefit of the AdvancedTCA specification, the Shelf Manager must be tightly integrated with the intelligent platform management system and fully tested for interoperability in the many possible configurations. In addition, the shelf supplier can significantly reduce deployment costs by providing configuration tools and working with the service provider to meet individual needs. All these pieces must be in place to achieve the AdvancedTCA promise of dynamic population of blades and maximum service availability.

The role of shelf management in the AdvancedTCA architecture

The Shelf Manager is the watchdog of the AdvancedTCA shelf. It continuously monitors the health of each blade and subsystem, manages environmental variables like power and cooling, enables seamless replacement of Field Replaceable Units (FRUs), and provides status and operations data back to the central system manager. This functionality, coupled with a robust chassis, provides the foundation for a fault-resistant application platform.

Within the bounds of AdvancedTCA specifications, the shelf management functionality can be implemented in various hardware and software configurations depending on the needs of the application. Top-of-the-line shelf suppliers will offer a range of options to accommodate different needs for shelf space, power consumption, cooling, or system cost.

At the center of the shelf management architecture is the Shelf Management Controller (ShMC), which is usually deployed in a redundant configuration. Current implementations utilize either a standalone card or a mezzanine on a carrier card.

The module typically consists of:

- An embedded RISC processor
- Ethernet and serial interfaces
- An embedded Linux kernel
- A shelf management program

The Shelf Manager accesses unique shelf configuration data stored in a shelf FRU module. The shelf FRU contains information such as number of backplane slots, chassis serial numbers, and slot descriptors. This data is considered part of the chassis infrastructure and typically does not change.

The Shelf Manager also uses information stored in Sensor Device Records (SDR). These files contain information regarding sensor thresholds, hysteresis, and linearization. It may become necessary to change these values based on the environment in which the shelf is used and individual customer requirements. It is important to understand the process of creating or modifying these records and the overall effect of even a minor change. In addition, there are various Linux startup scripts, environment variables, and Shelf Manager configuration files that, if modified, can significantly change the operating parameters of the shelf management system (Figure 1).

The ShMC communicates with other components via the Intelligent Platform Management Interface (IPMI). Each AdvancedTCA-compliant FRU within the shelf hosts its own local management controller, the IPMC, which communicates out of band with the ShMC

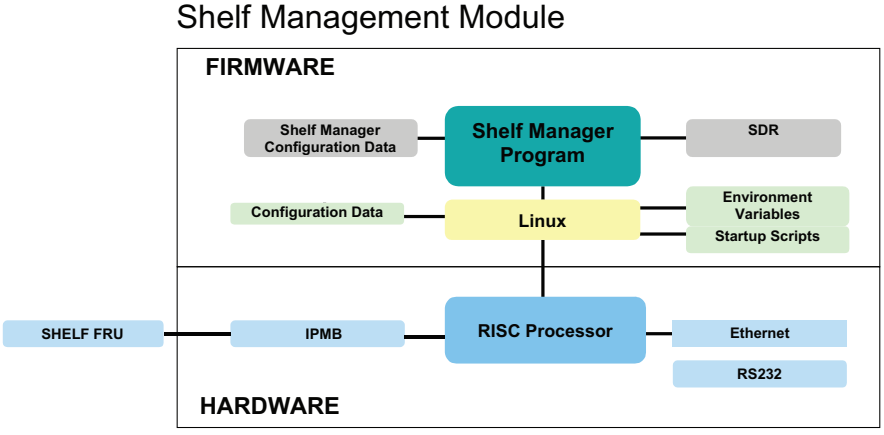

Figure 1

over the backplane IPMB. Together they form the shelf management infrastructure (Figure 2).

Going beyond the specification

The AdvancedTCA specification encompasses a broad range of shelf management features and capabilities. In addition, Shelf Manager suppliers have added numerous extensions to the specification to address the needs of open modular systems. Add to that the need to interface with many different configurations of AdvancedTCA hardware, and shelf management configuration can become quite complex, easily consuming time and resources that could otherwise be devoted to developing value-added features and applications.

System manufacturers and system integrators may not have an employee with sufficient expertise in shelf management systems. Moreover, if there is an issue during deployment, valuable time may be taken up just to become familiar with the Shelf Manager firmware and hardware. As with any open standard, the reality of building robust systems for the field requires close cooperation among component developers and reliance on their expertise with their respective subsystems.

General expertise in AdvancedTCA shelf management is not sufficient, because AdvancedTCA-compliant implementations vary greatly. Unfortunately, the differences often do not become apparent until the critical stages of configuration before going online, and later during live hardware and firmware upgrades. In these situations, it is imperative to have a shelf supplier with a deep understanding both of their specific Shelf Manager subsystem and of the special aspects of this particular installation. This expertise can make the difference between expensive downtime and a seamless, trouble-free upgrade.

The top shelf suppliers have already taken the time and effort to understand every aspect of the implementation of shelf management in their products. They demonstrate this by keeping abreast of all new feature developments and firmware releases from the shelf management vendors, by providing custom configuration scripts and documentation, and by maintaining onsite test beds that correspond exactly to the customer's hardware configuration. This allows them to quickly develop custom solutions and resolve issues. By testing and qualifying new firmware and working closely with the shelf management vendors, they are able to provide turnkey solutions that allow their customers to get to market quickly and securely with new services.

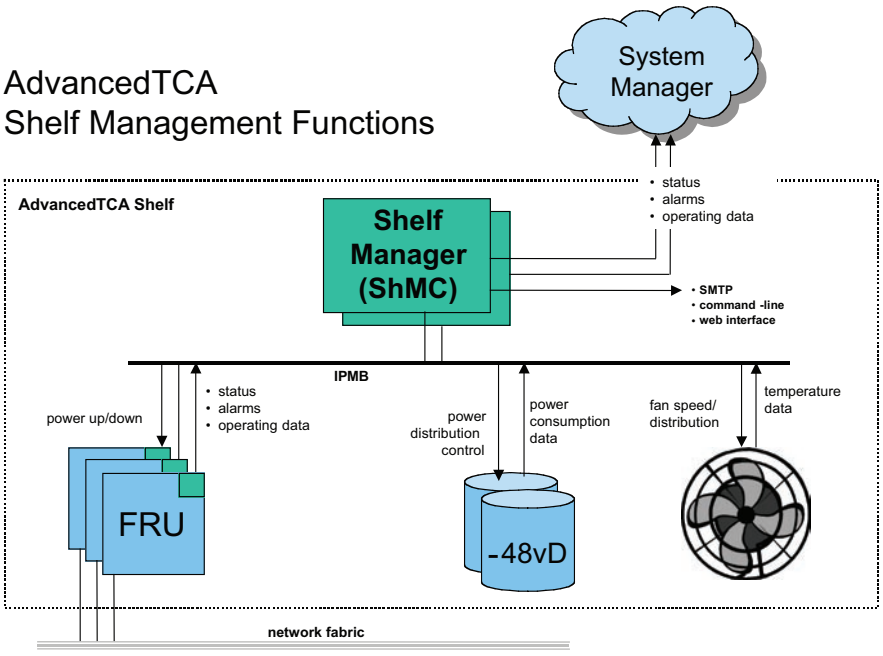

Figure 2

What to expect from a shelf supplier

When system manufacturers and system integrators evaluate a shelf supplier's Shelf Manager capabilities, they should look for the following attributes:

Flexibility

Several good shelf management solutions are available from different vendors, each with their own strengths. The shelf supplier should offer several options, allowing you to select the one that best meets your needs.

Integration

The shelf should be fully tested and proven to work with the Shelf Manager in all configurations and with the latest firmware updates. The PICMG organization holds a series of interoperability workshops. Check to see if your provider is active in these meetings.

Setup and configuration

Field upgrades are a fact of life, and AdvancedTCA makes them easier with hot pluggability. Accordingly, subsystems must be integrated, and shelf suppliers should provide foolproof instructions for updating live systems. Shelf suppliers should also provide customized scripts for each unique configuration and be on hand to help during actual deployment.

Support

A shelf supplier should serve as a true value-added partner, working backward with the shelf management providers and forward with the system manufacturers, system integrators and service providers to ensure a seamless integration and smooth deployment.

All of these attributes are evident in an example from a real life integration scenario. A customer of AdvancedTCA shelf supplier Carlo Gavazzi Computing Solutions needed a chassis with enhanced cooling (Figure 3). Carlo Gavazzi engineers designed a shelf with upgraded fans and filters, which in turn required updates to the fan control and Shelf Manager firmware. Carlo Gavazzi worked with its shelf management partners to create an integrated solution complete with instructions and support, allowing its customer to retrofit units in the field and easily perform the updates.

Figure 3

Conclusion

The AdvancedTCA specification provides system designers the promise of freedom of choice and reliable interoperability among standardized components. It depends on proactive and expert suppliers, however, to deliver on that promise for critical components such as the shelf management subsystem.

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