Coordination of specifications enables rapid COTS system development

MOUNTAIN VIEW ALLIANCE

Enabling the COTS ecosystem through coordinated open specifications

Introduction

This paper is intended to give the reader insight into the benefits of developing systems based on a coordinated set of specifications from three industry consortia that have formed an alliance. These three groups are (alphabetically) the NPF (Network Processing Forum), PICMG (PCI Industrial Computer Manufacturers Group), and the SA Forum (Service Availability™ Forum). Their alliance is called the Mountain View Alliance. The alliance's goal is to harmonize their specifications and promote their use.

In 1864, William Sellers initiated the effort that led to the standardization of the dimensions of the screw. This effort enabled industrial advancement, the benefit of which reaches to the present. In our day, many technology industry consortia and forums develop specifications. To date, these groups have largely worked in isolation, without trying to work together to harmonize those specifications and promote their use.

The Value of Standardization

Standards create value in many ways. One way is to help create a market arena for products developed to a given standard or specification. Standards also promote innovation, lower development costs, lower time to market, enable investment in test equipment and verification technologies, streamline inventories, enable rapid integration of complex systems, and enable the creation of robust multi-vendor ecosystems.

Standardization enables vendor specialization and innovation because a vendor with world-class knowledge in a narrow field can develop a product that leverages that knowledge and deliver that product to a standardized interface into an ecosystem of other products. That potentially small vendor does not need to solve all of the problems surrounding the product, but instead can focus on solving a narrow problem and delivering a best-in-class product to a standardized interface. Standardization also allows consumers of technology to focus on adding their own value instead of having to struggle to integrate best-in-class products from different suppliers. If the integration cost is both low and similar across vendors, then the evaluation criteria for components shifts to features, performance, and unit cost.

Standardization promotes investment in test equipment and verification technologies because it provides these vendors with a standardized interface to design to. Without standards, test and verification vendors might be reluctant to invest in an expensive specialized development effort when facing a potentially fragmented market.

Standardization also enables the creation of robust, multi-vendor ecosystems. The adoption of a given interface often depends on that interface reaching critical mass. Formation of that critical mass is more likely when multiple vendors develop complementary and competing products to a given interface. The presence of multiple solutions gives consumers choice in the present and confidence in the future availability of ever more sophisticated and cost-reduced products.

Three Standards Organizations Form Alliance

The Mountain View Alliance was formed in 2005 to promote the user adoption of a collection of specifications and technologies produced or enabled by three different industry groups. Those groups are (alphabetically) the NPF, the PICMG, and the SA Forum.

The NPF

The Network Processing Forum (NPF) was organized to facilitate and accelerate the development of next-generation networking and telecommunications products based on network processing technologies. By establishing common software APIs and hardware specifications for networking services and functions and providing benchmarks for those specifications, the NPF enables equipment manufacturers to significantly reduce their design burden, while having the flexibility to use the best components to fit their requirements.

PICMG

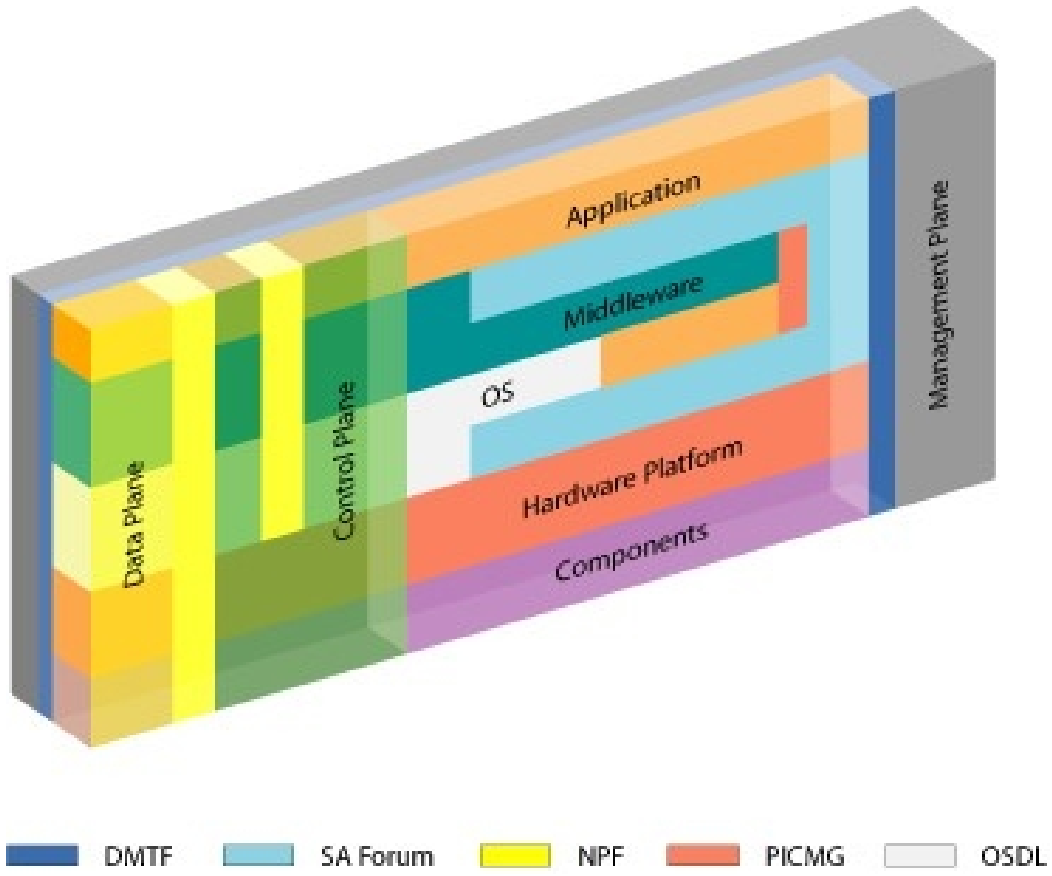
PICMG (PCI Industrial Computer Manufacturers Group) is a consortium of over 450 companies who collaboratively develop open specifications for high performance telecommunications and industrial computing applications. Founded in 1994, PICMG's original mission was to extend the PCI standard, as approved by the PCI Special Interest Group (PCI SIG), for computer systems such as PCI/ISA, PCI/EISA and the PCI/3U or 6U Eurocard form factor known as CompactPCI. PICMG continues to develop important extensions and improvements to CompactPCI. Recently, PICMG announced it was beginning development of a new series of specifications, called AdvancedTCA®, for next-generation telecommunications equipment, with a new form factor and based on switched fabric architectures.

The SA Forum

End-users expect that voice, data and multimedia services will be delivered with the dependability of traditional telecommunications. To meet these expectations, providers must be able to guarantee service integrity, and manufacturers must build packet-based equipment that achieves the highest levels of service continuity, while meeting ever-shorter development cycles. The Service Availability™ Forum is addressing this by fostering an ecosystem to enable the use of commercial ofl-the-shelf building blocks in the creation of high availability network infrastructure products, systems and services. The Service Availability™ Forum accomplishes this through developing and publishing high availability and management software interface specifications as well promoting and facilitating their adoption by the industry.

Diagram of the Domains of each of the Member Organizations

The following diagram represents the domains that each of the three organizations works within. It also includes the OSDL (Open Source Development Lab) and the DMTF (Distributed Management Task Force), with which the SA Forum has active liaison relationships.



The color code represents the domain that each group works in.

The Multiplier Effect

Collectively, the specifications produced by these three groups as well as from other groups are a powerful enabler of system development. These specifications together enable vendors to rapidly produce high-value systems through the integration of a collection of standards-based, off-the-shelf hardware and software components potentially mixed with that vendor's value-added components or "secret sauce."

The use of a collection of specifications may allow a multiplier effect to the benefits from the use of these specifications individually because a critical mass of critical masses might develop. For this reason, these three groups have come together to draw attention to their usefulness.

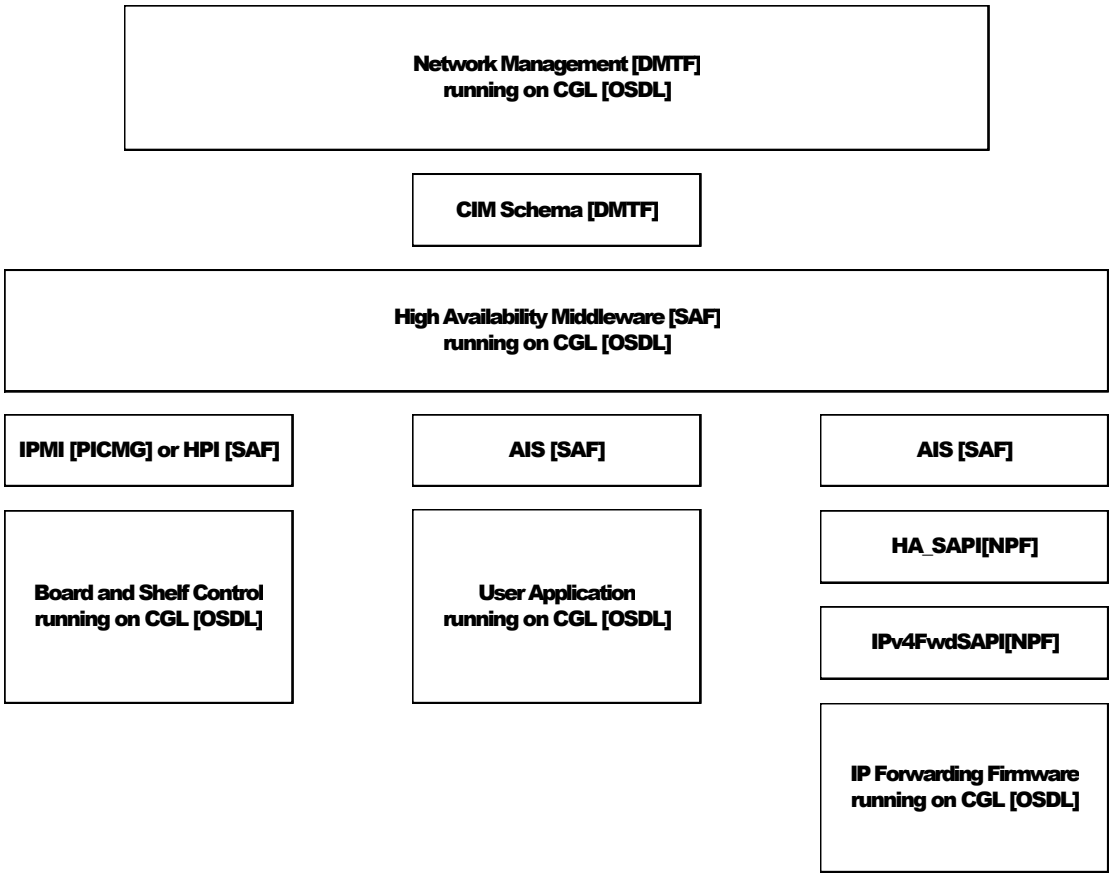
Standards Harmonization

The Mountain View Alliance is also serving as a forum to enable harmonization of these specifications. This forum enables technical representatives from the different standards organizations to sit down together and look for gaps and overlaps between the

standards. When gaps and/or overlaps are found, the Mountain View Alliance encourages the appropriate standards organizations to resolve them.

A System Example: Card Failover

The following is an example of a complex, high-value function that is enabled by the use of the collection of specifications created by the three groups in the Mountain View Alliance together with those of the OSDL and the DMTF, which the SA Forum has active liaisons with:



This example talks about the Boot-Up, Operation and Failover phases.

System Boot-Up Phase

1. **Power up ATCA Shelf [PICMG]**
2. **Boot Carrier Grade Linux [OSDL] on the Management Module and on each of the Board Management Controllers**
3. **Boot the Shelf/Board Management middleware on each of the Controllers**

4. Boot the HA Middleware [SA Forum] on each of the cards
5. Communicate with the Network Management platform through CIM Schema [DMTF]
6. Detect shelf configuration and negotiate board power demands with Shelf Management middleware via the IPMI [PICMG] (or the related HPI [SA Forum]) interfaces.
7. The HA Middleware [SA Forum] establishes Service Groups
8. Register each physical resource, including the cards, with the HA Middleware [SA Forum]
9. Download service level configuration into the HA middleware through the Systems Management Interface [SA Forum]
10. Boot Carrier Grade Linux on each of the functional cards [ODSL]
11. Boot the applications on each of the functional cards and register them with the High Availability Middleware [SA Forum] through the Application Interface Specification [AIS]
12. Create an instance of an IP Forwarding Application which uses the IPv4 Forwarding Service API (Ipv4FwdSAPI) [NPF] on a line card
13. Register that application through the sequence of the High Availability Service API (HA_SAPI) [NPF] and the Application Interface Specification (AIS) [SA Forum] with the High Availability Middleware [SA Forum]

Operational Phase

1. **Monitor the status of the cards with the IPMI [PICMG] (or the related HPI [SA Forum])**
2. **Monitor the status of the shelf through CIM Schema [DMTF]**
3. **Monitor the status of the functions with the Component Healthcheck Monitors [SA Forum]**
4. **Update the state between redundant resources with Checkpoints [SA Forum]**
5. **Run the applications on each card on top of Carrier Grade Linux [OSDL]**
6. **Run the data plane through an application which uses the Ipv4SAPI [NPF]**

Failover Phase

1. **A card fails**
2. **A Component Healthcheck Monitor [SA Forum] fails**
3. **The High Availability Middleware [SA Forum] takes action based on this failure and selects another card within a given Service Group to take over.**
4. **The High Availability Middleware [SA Forum] configures the spare card (if it not already configured) via IPMI [PICMG] (or the related HPI [SA Forum]) interfaces**
5. **The High Availability Middleware [SA Forum] configures the standby card including enabling an instance of an application that uses Ipv4FwdSAPI [NPF] via the sequence of the Application Interface Specification (AIS) [SA Forum] and the HA_SAPI [NPF]**
6. **The High Availability Middleware [SA Forum] enables the traffic to flow through the spare card via IPMI [PICMG] or HPI [SA Forum]**
7. **The High Availability Middleware [SA Forum] informs the Network Management that a switchover has occurred via CIM Schema [DMTF]**

Conclusion

In conclusion, the use of coordinated specifications from the standards organizations comprising the Mountain View Alliance together with specifications from other industry groups enables high value systems to be created from off-the-shelf components. By working together, these groups can further enhance and refine these specifications.