The shifting landscape of telecommunication standards

By Stuart Jamieson, Emerson Network Power

Success in the telecommunication market demands the ability to negotiate the wide and shifting landscape of telecommunication standards. Companies must invest heavily for the necessary expertise, or work with vendors already engaged with standards organisations.

Figure 1. Software for telecommunications systems is organized to give developers inter-related building blocks (Source: Service Availability Forum)

To remain competitive, telecommunication vendors have to move from proprietary designs to ones based on open industry standards. Standards and specification-based design offers many advantages. By fostering the development of commercially available building blocks with significant capabilities, standards help lower system design and development time. Because such blocks have applicability beyond a single system design, their market size supports economies of scale that help lower system production costs. These markets also foster competition that both lowers cost and stimulates innovation. Thus, open standards help telecom vendors more successfully address all the issues facing the telecommunication industry.

The ATCA open specification was developed by PICMG to incorporate features such as switched serial backplanes, remote system management of individual modules, hot-swap capability, and provisions for implementing high-reliability architectures, all common requirements in telecommunication designs. In order to increase the modularity of ATCA designs, PICMG developed the advanced mezzanine card (AMC) specification. The placement of these modules on the ATCA card gives them access to backplane connections, so they can be used to customize the I/O of an ATCA card as well as to carry processors or storage peripherals. An ATCA card can carry as many as four AMC modules, giving designers a variety of potential configurations from a single card. Like an ATCA card, AMC modules allow remote system management and hot-swap capability of individual modules.

The capacity of AMC modules, as well as their hot-swap and remote management capabilities, enable them to provide the same kinds of functionality as ATCA cards, although with more modest performance. PICMG has leveraged this AMC capability to define a smaller, lower-cost telecommunication system standard called MicroTCA that uses only AMC modules plugging directly into a backplane. MicroTCA systems use the same AMC modules and essentially the same software as ATCA systems, providing designers with an opportunity to create a range of systems using a common set of open standard building blocks.

The software part of the telecommunication open standard/specification story includes the Linux operating system (OS). The Linux OS is a royalty-free product available from a variety of vendors that provide service and support for developers using the OS. As with cPCI, ATCA, AMC, and MicroTCA hardware, the Linux OS can serve developers of telecommunication systems as a standard design element that offers low cost, multi-vendor availability, and continual innovation that proprietary system designs cannot match. One way to begin understanding the standards/specifications ecosystem is to look at the structure of a telecommunication system, then match the various standards/specifications to elements in this structure.

The structure begins, of course, with the system hardware platform. The next layer of the structure is the operating system. Here, Linux has been the OS of choice both because it is an open standard and because it is royalty-free. CG Linux works in conjunction with a service-availability middleware layer, system management software, and a hardware platform interface to form the software foundation of a telecommunication system. These software blocks provide services and functions such as failure detection, fail-over response, and hot-swap management, missing from Linux but needed for high-availability design

In order to allow system developers to be able to focus on applications development and new services, rather than mundane system operation, an additional middleware is needed. This additional middleware serves to abstract the underlying system so that developers can write applications to a standard applications programming interface (API) yet run the applications on any standard-based system design. The top layer of this structure is the applications

software. This software would sit on a set of standard APIs which allow for ease of porting. This is where the system developer adds their value to the system. Efforts to develop open standards and specifications for the creation of telecommunication systems roughly follow the same structure as the system design. Each of the system layers requires its own set of documents, and a host of industry consortia have arisen to develop those requirements. The result has been the development of an entire standards and specifications ecosystem, with some groups addressing the needs of a specific layer and other groups addressing the interfaces between layers as well as coordinating the overall effort.

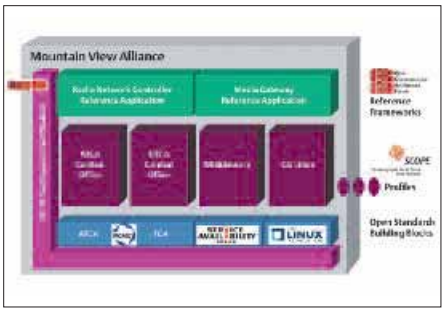

Figure 2. The industry organisations tackling the definition of open source standards for telecommunications are roughly aligned to the system design structure. (Source: Emerson Network Power)

The structure of the telecommunication standards ecosystem begins with the open platform building blocks. Because these blocks typically come from different vendors, the standards efforts include the definition of interfaces between the layers. Several organisations are involved in the definition of open platform standards. The PCI Industrial Computer Manufacturers Group (PICMG) has defined the board and chassis standards, including ATCA, AMC, and MicroTCA. The Linux Foundation developed standards for a carrier-grade, Linux-based operating system. The Service Availability Forum (SAF) has tackled the specific needs of high-availability system design, defining the management functions and interfaces that building blocks must offer. In addition, the OpenSAF organization was created to assume stewardship of an open-source implementation of the SAF application interface specification (AIS).

As an aide to the vendors of such hardware and software building blocks, the telecommunication industry itself has begun defining reference system profiles. These profiles outline the hardware and software needs of various types of equipment in terms of the tasks the equipment is to perform and the functions it needs to perform them. Profiles give developers a specific product target, which helps ensure that the standards/specifications that building block vendors define adequately address the telecommunication equipment developers needs.

Finally the Open Communication Architecture Forum (OCAF) Focus Group of the International Telecommunications Union (ITU) has developed a similar set of references to guide application interface development. The reference application frameworks are full-system applications implemented in software and isolated from the platform hardware design.

While standards and specifications go a long way toward ensuring that developers will produce building-block products that system integrators can combine as needed, they invariably leave some details open to interpretation. Such ambiguity can result in interoperability issues. To address these issues, and to

Standards Body	Area(s) of Activity
PICMG (PCI Industrial Computer Manufacturers Group)	Hardware: CompactPCI, ATCA, MicroTCA, AMC
Service Availability Forum (SAF)	High-availability middleware; hardware management (failover, fault isolation, etc)
Linux Foundation (LF)	Carrier grade Linux OS
SCOPE	System hardware and software profiles
OpenSAF	Open-source middleware
Open Communication Architecture Forum (OCAF)	Reference system frameworks
Communications Platforms Trade Association (CP-TA)	Interoperability and compatibility testing
Mountain View Alliance (MVA)	Overall guidance and standards coordination

Table 1. A variety of organisations are involved in creating open standards for telecommunications systems building blocks

ensure that developers properly adhere to the standards, some form of independent testing must be in place. In the telecommunication ecosystem, various industry groups are offering component testing and certification as well as system-wide testing.

For hardware-level interoperability testing, PICMG has been running a series of interoperability workshops where vendors can come together to test their implementation of the specifications. Such workshop testing, however, provides no guarantees to the vendors customers. To resolve this gap and to cover both hardware and software interoperability at the system level, an industry group called the Communications Platform Trade Association (CP-TA) has arisen. It focused first on ATCA-based systems, and created both a test procedures manual (TPM) and an interoperability certification document (ICD) for such systems.

With profiles, frameworks, interfaces, hardware, and software standards all under development by different organizations, the industry can benefit from an umbrella organisation that provides a marketing umbrella along with coordination and system-level guidance to all the standards-generating organisations. This is the task of the Mountain View Alliance (MVA), composed of representatives from the various organisations. The MVA goal is to provide a mechanism for harmonizing the development efforts of these organisations, allowing them to leverage each others' results while avoiding overlap. Additionally it provides a marketing vehicle to promote and encourage the development and implementation of standards/-specifications.

The MVA arose because there is a real risk that the efforts will take diverging paths due to differences in interpretation of telecommunication system needs. The component vendor organisations, such as PICMG, the Linux Foundation, and the SA Forum, are working from their perceptions of the telecommunication equipment manufacturers (TEMS) common needs. The TEMS, through SCOPE, are working from the other end and defining requirements based on their collective and sometimes individual needs. Applications standards, through the efforts of the SA Forum, Linux Foundation, and SCOPE, are being developed to be independent of the underlying platform structure.

The result, if not monitored, can be the creation of software standards/specifications divorced and divergent from the hardware standards/specifications. The MVA and CP-TA groups are there to ensure that everything fits together, as well as to fill the gaps left in the standards ecosystem by the separation of activities. There are two ways that companies can maintain currency. One is to make a substantial investment in attaining the required expertise. This requires first becoming familiar with all the relevant standards and specifications, their scope and their application. Next, the companies have to become members of the various organisations to ensure that they have immediate access to revisions as they arise, and have a clear view of how the standards and specifications are evolving over time. Maintaining these levels of activity requires the use of dedicated personnel simply to keep abreast of the many standards.

The alternative approach is to work with vendors like Emerson that are already engaged with the standards organisations. Such vendors will have in-depth understanding of current standards and specifications as well as advanced knowledge of pending changes. This level of insight helps ensure that the products these vendors offer are up-to-date, have proven interoperability, and offer a growth path for future system evolution. Using such products as building blocks, developers can readily create competitive designs to current and near-future industry specifications.■