AdvancedTCA Beyond Telecom

The open standard steps out of the central office

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Executive Summary

AdvancedTCA® (ATCA®) is an established, commercial off-the-shelf (COTS) open-standard bladed computing architecture suitable for a mix of environments, ranging from semi-industrial to more data center-like. From its inception in 2001, ATCA technology was designed to serve as a fundamental basis for network-ready, carrier-grade common platforms. However, in recent years, the performance of the server-class components has become closer to that of commercial bladed servers than originally was the case. And so, increasingly the technology is being considered for applications beyond telecom.

Applications that fall into the category of "carrier enterprise", often located in a network data center, are among the first telecom-adjacent services taking advantage of ATCA technology. Some companies in military, medical imaging, scientific experimentation and process control industries have also made the ATCA platform choice. And more companies and industries are following.

As one example of why – consider that the cost of service or network downtime can be immense, with applications outages in key industries costing millions of dollars per hour. Recent Gartner analysis has shown that application outages are costly across a wide range of industries beyond telecommunications, including financial services, manufacturing, retail and energy. That is why, in recent years, system integrators across this wide range of environments have sought out a stable, cost-effective platform to support their business critical applications. ATCA technology, with its heritage of reliability, can potentially meet those needs.

Such interest has encouraged the ATCA industry to make further evolutionary strides to better meet the needs of applications outside the telecom central office. This eBook explains more about why and how.

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Telecom Success

Since the first ATCA products were released, the standard has gained considerable strength and has established itself as the premier technology platform for telecom applications. Initial deployments centered on control and signaling applications, including IMS core, CSCF, HLR, RNC and BSC. Next-generation applications have since been enabled, thanks to the advent of 10Gbps fabric switching technology and 40Gbps-ready infrastructure which is currently available.

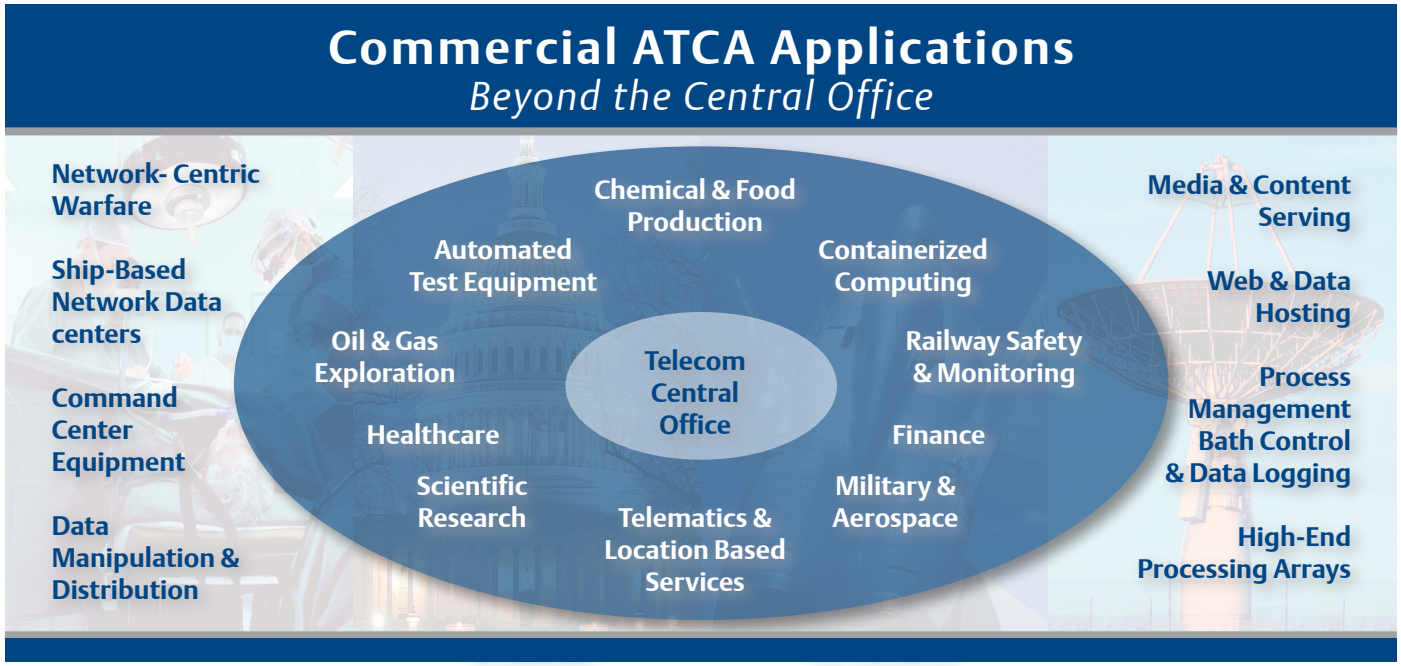
All of the network equipment manufacturers who deployed in phase one now have second, and - in some cases - third generation platforms under development. All of this drives further application and volume expansion, and by comparison to other technologies, industry analysts project ATCA products will represent the majority of merchant (i.e., open market) embedded computing spend for telecom applications up to 2014 and beyond.

For proof, we only need to look to publicly announced ATCA based carrier-grade products that include:

- Nortel's Versatile Service Engine – deployed by AT&T
- Alcatel-Lucent's HSS, SGSN and IP-BSC – deployed widely
- Motorola Networks' Carrier Access Point Controller – deployed widely
- NEC's Radio Network Controller – deployed widely
- Tekelek's TekCore IMS Core Platform

Recent analysis (summarized in VDC's Global xTCA Opportunity report published in March 2009) indicates that the market for ATCA merchant platforms and blades is projected to be worth around $530M in 2009 and as much as $1.3B in 2012 despite the effect of any economic downturn. Furthermore, the ecosystem now extends to over 50 main suppliers and more than 100 related suppliers providing equipment makers with a choice from a combined portfolio of over 360 ATCA products. As a result of this unprecedented growth, as well as the intrinsic flexibility of the standard, ATCA technology is now being considered for multiple applications outside the central office where a more relaxed cooling environment exists, as lower operating temperatures facilitates higher performance potential.

Beyond Telecom (Part 1)



Thanks to this well-documented proliferation of successful deployments and the business benefits realized by network equipment providers (NEPs) and operators, the ATCA ecosystem is now driving enhancements to the technology and extensions to the standard itself. This allows these benefits to be brought to additional applications outside of the central office and, in some cases, outside the telecom industry altogether.

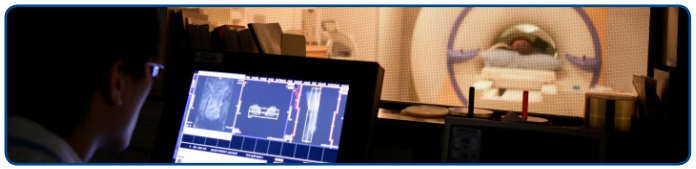
It is important to note that this trend is not simply being driven by vendors. Increasingly, the problems confronting companies running services have nothing to do with server capability. Rather, these problems most often stem from power consumption, cooling requirements, serviceability, and increasingly the cost of downtime. Since the ATCA specification was designed for use in high reliability

More information on the suitability of ATCA for military environments is on page 7.

Beyond Telecom (Part 2)


Government


Industrial Automation


Medical


Military & Aerospace


Telecommunications

telecom network applications, it brings values such as open standards, inherent reliability and power efficiency to the already established benefits of bladed architectures such as scalability and serviceability. As a measure of how importantly this is viewed, the number and value of "server class" opportunities for Emerson Network Power's ATCA solutions have more than tripled since 2007.

Therefore, the ATCA ecosystem is placing a greater focus on incorporating server-class attributes into next-generation products, including integrated and certified enterprise-grade operating systems, virtualization-ready hardware and diverse storage expansion options. For example, Emerson Network Power is the first ATCA system provider to be certified and supported by leading information infrastructure provider EMC, and there are several ecosystem partners providing in-shelf storage expansion options.

In addition, the military is utilizing ATCA technology as it moves to packet-based protocols – the backdrop and underpinning of their intelligent warfare programs. In fact, ATCA has been proposed as the core embedded computing technology for the US Navy's Consolidated Afloat Networks and Enterprise Services (CANES) program, which aims to consolidate the shipboard network infrastructure into a standard off-the-shelf solution.

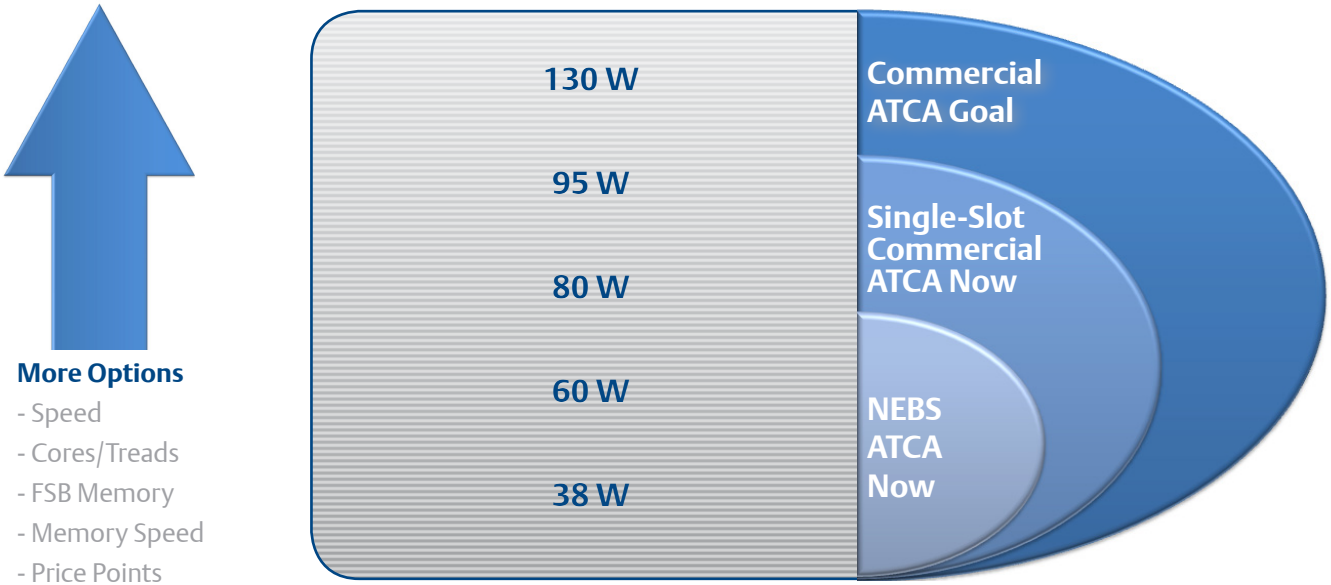
More information on the suitability of ATCA for military environments is on page 7.

Implications for Processor Selection

Applications outside the central office – where ATCA technology is now being considered – usually have a more relaxed cooling environment. For instance, the ASHRAE standards applied to data centers indicate a controlled environment with a maximum ambient temperature of 35ºC (the NEBS equivalent is 55ºC). In a 35ºC environment, for the same airflow, more power can therefore be dissipated or lower temperature parts can be used. To give some idea what this means, consider that in a 55ºC NEBS environment with a typical airflow of 40CFM per slot, it is just about possible to cool a server blade equipped with dual 60 Watt NEBS-grade Intel® processors. Within the same airflow, but with an ambient temperature of 35ºC, it is possible to cool the same blade but now equipped with 80 Watt enterprise-grade (cheaper) processors. This improved performance, coupled with the native attributes of ATCA (open standard, reliable, power efficiency), appeal to many non-telecom applications where service availability and thermal performance are important.

Implications for Processor Selection

e.g., Intel® Xeon® Processor 5500 Series (Nehalem Architecture)



More Options
- Speed
- Cores/Treads
- FSB Memory
- Memory Speed
- Price Points

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Barge Tested

To verify the continual operation of on-board (on a ship, for example) equipment throughout a blast scenario, Northrop Grumman recently tested Emerson Network Power AdvancedTCA equipment. Afloat shock testing is better known in the defense industry as barge testing. The test involved placing 60 pounds of MX-1 plastic explosives 24 feet deep and 20 feet away from a barge containing the functioning equipment – and then detonating it.

Emerson supplied a 14-slot AdvancedTCA shelf outfitted with two single-slot combined system controller and switch blades and two processor blades, each featuring dual Intel® Xeon® LV processors. A second, smaller two-slot system, again containing two Intel-based processor blades, was also included in the testing. Both systems were running Red Hat Linux.

The barge test team mounted the AdvancedTCA systems shock-isolated Northrop racks, of the type used for a variety of programs, and secured them to the floor of the barge. An umbilical optical Ethernet link connected the systems back to the barge test control room. This enabled constant monitoring and communication during the test. A stream of PINGs and other mechanisms verified continual operation of the equipment.

Test equipment and cameras in the barge measure the movement of the racks during the testing. Multiple blasts were conducted over several days to account for different rack positions, equipment weightings, and physical orientation. Test results showed no equipment failures or system resets for any of the Emerson products on board the barge.

Medical & Scientific

New deployments have also expanded into cutting-edge medical and scientific laboratory environments. For example, a recent medical symposium heard a proposal for a flexible ATCA based system to support Multimodality Positron Emission Tomography (MPET), a medical imaging and diagnostic technique.

Another prime example is in the scientific research field, where ATCA products are also already in use in several lead projects, such as NASA's Jet Propulsion Laboratory Deep Space Network and the Tokamak Fusion Reactor in the Czech Republic.

These types of programs reflect an underlying trend, similar in some respects to the next generation all-IP network evolution within the telecom industry. High availability, scalability and manageability – the traits inherent to ATCA - are critical for the success of large scale experiments. The adoption of increased bandwidth infrastructures has also enabled the ATCA ecosystem to showcase the standard's ability to adapt to new challenges.

Commercial ATCA

Emerson Network Power were early proponents of this initiative, having coined the term “Commercial ATCA” to describe a product strategy that adapts the ATCA specification to take it beyond the central office and into “commercial” applications, including media and content serving, network-centric warfare and web/data hosting. Commercial ATCA aims to maintain the key values of the ATCA specifications but omitting some of the harder NEBS telecom specific features that are not valued beyond the telecom central office.

Emerson Network Power’s first Commercial ATCA product in the market, the Katana® 2000 ATCA Bladed Server, is designed to deliver benefits over a solution consisting of two rack mount servers, including power efficiency, reliability, serviceability, scalability, investment protection and environmental (i.e., “green”) factors such as reusability of core components versus disposal of a complete server. The Katana 2000 Bladed Server features a 1+1 server blade architecture, with two server blades each featuring dual 80 Watt “commercial grade” Intel® Xeon® E5520/E5540 processors based on the Intel® Nehalem Microarchitecture.

Katana® 2000 ATCA Bladed Server

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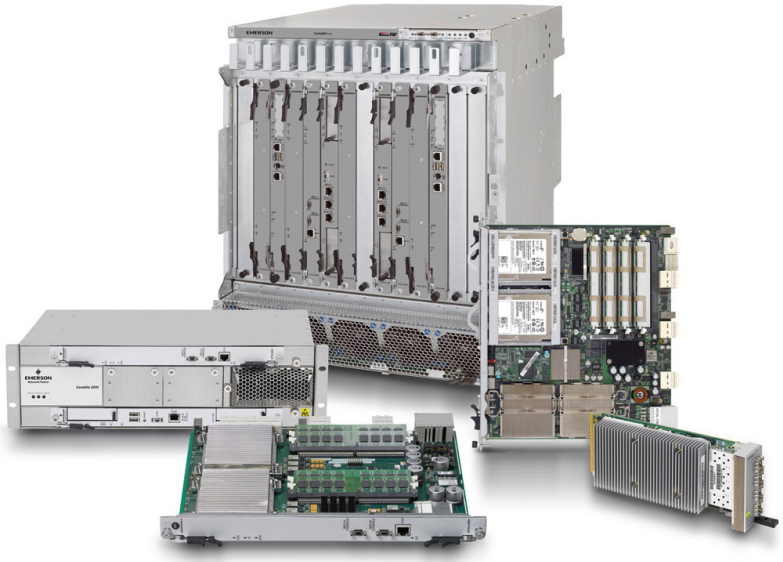
ATCA Extensions



It is clear that the overarching appeal of ATCA products beyond the telecom central office environment has evolved thanks to the diverse benefits enabled by an open, high-performance bladed architecture - and especially when optimized for use outside the central office environment. This evolution has also recently caught the interest of PICMG®, which now plans to propose formal improvements to the ATCA standard for these new application areas. The organization has established a new subcommittee to develop the standard – named ATCA Extensions.

The brief for "ATCA Extensions" is fairly wide-ranging, encompassing from simple changes to make existing blades more cost-optimized for non-central office environments through to supporting new higher compute density system configurations including double-wide server blades to make use of bigger heat sinks to further increase CPU power and back-to-back enclosures to make more use of typical data center rack depths. However, backwards and forwards compatibility remains a key driving principle, preserving existing investment and the ability to make use of other components in the ecosystem to arrive at the best solution.

The ATCA open-standard remains an established, successful and evolving technology platform that will undoubtedly continue to benefit new applications for years to come. NEPs and the entire ATCA ecosystem have invested a considerable amount of development time and money to arrive where we are today. And this investment is paying off as these benefits are realized by system integrators across diverse markets. The standard has now bridged the gap between the telecom central office and proliferation into a host of other server-grade applications – a bridge the ATCA ecosystem has now clearly positioned itself to cross.

Glossary

AdvancedTCA® (ATCA®)	Advanced Telecommunications Computing Architecture
ASHRAE	The American Society of Heating, Refrigerating and Air-Conditioning Engineers
BSC	Base Station Controller
CFM	Cubic Feet per Minute
COTS	Commercial off-the-shelf
CSCF	Call Session Control Function
HLR	Home Location Register
HSS	Home Subscriber Server
IMS	IP Multimedia Subsystem
IP-BSC	IP Base Station Controller
NEBS	Network Equipment-Building System
NEP	Network Equipment Providers
PICMG®	PCI Industrial Computer Manufacturers Group
RNC	Radio Network Controller
SGSN	Serving GPRS Support Node

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Emerson Network Power, a business of Emerson (NYSE:EMR), is the global leader in enabling Business-Critical Continuity™. The company is the trusted source for adaptive and ultra-reliable solutions that enable and protect its customers' business-critical technology infrastructures.

Through its Embedded Computing business, Emerson Network Power enables original equipment manufacturers (OEMs) and systems integrators to develop better products quickly, cost-effectively and with less risk.

The Embedded Computing business of Emerson Network Power is a recognized leading provider of products and services based on open standards such as AdvancedTCA®, MicroTCA®, AdvancedMC™ CompactPCI®, Processor PMC, VMEbus and OpenSAF™. Our broad product portfolio, ranging from communications servers, application-ready platforms, blades and modules to enabling software and professional services, enables OEMs to focus on staying ahead of the competition.

Manufacturers of equipment for telecommunications, defense, aerospace, medical and industrial automation markets can trust Emerson's proven track record of business stability and technology innovation. Working with Emerson helps them shift more of their development efforts to the deployment of new, value-add features and services that create competitive advantage and build market share.

Emerson's commitment to open, standards-based solutions goes back over 25 years and our deep understanding of the embedded computing needs of OEMs provide the foundation for the market to look to us for leadership and innovation.

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