ADLINK TECHNOLOGY INC.

AdvancedTCA Application Ready Intelligent Platforms for Telecom Solutions

Green, Smart, Robust

- Application Ready Intelligent Platforms (ARIP)
- Data Plane Development Kit (DPDK)
- Media Software Development Kit (MSDK)
- Embedded Power Management Agent (EPMA)
- ADLINK ARIP Product Selection Guide



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Table of Contents

- Corporate Overview — P1
- Application Ready Intelligent Platforms (ARIP) Solutions — P4
- Data Plane Development Kit (DPDK) — P8
- Media Software Development Kit (MSDK) — P10
- Embedded Power Management Agent (EPMA) — P12
- New 40G ARIP Product Highlight — P14
- ARIP Product Selection Guide — P16

Corporate Overview

A Global Company

ADLINK, a manufacturer of embedded computing technology, leads the field with integration of x86 computing power, rugged design, high availability, and industrial I/O. Dedicated to test & measurement, industrial automation, defense and aerospace, gaming, communications, medical, and transportation applications, ADLINK has made a name for itself providing reliable products of superior quality for cost-effective solutions, allowing our customers around the world to significantly reduce time-to-market burdens whilst increasing their competitive edge.

By providing leading-edge application-ready platforms and industrial building blocks, ADLINK empowers our customers, allowing them to minimize total cost of ownership (TOC) with customization and system integration advantages, keeping manufacturing costs low and extending product lifecycles.

ADLINK's advanced testing and manufacturing facilities are ISO 9001, ISO-14001, ISO-13485 and TL9000-certified, ensuring consistency and the highest quality possible in products and services.

Headquartered in Taiwan, ADLINK has operations in America, Singapore, India, China, Japan, Korea, France, and Germany. ADLINK products are currently available in over 40 countries across 5 continents, with worldwide distribution networks and offices and over 1600 employees.



No matter where you are, ADLINK is able to support you on a global basis.

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Products and Services

In keeping with our firm commitment to an ideal package consisting of both best-value products and effective technical support, ADLINK empowers customers with market-leading computing products backed by professional consulting and OEM services.

Embedded Computing / Module Computing

ADLINK works closely with Intel to ensure that we develop and introduce innovative computing technologies by implementing embedded computing roadmaps and selecting computer solutions that best fit our target markets. This enables ADLINK to provide the highest quality and performance products with the long life cycles required by our embedded and applied computing customers. With the acquisition of Ampro Computers and LiPPERT Embedded Computers, ADLINK also provides a wide range of rugged by design Extreme Rugged™ and industrial product lines including single board computers, COMs and systems.

Our range of products includes:

- AdvancedTCA Application Ready Intelligent Platforms
- 6U/3U CompactPCI Platforms
- Computer-on-Modules
- Rugged Small Form Factor and Single Board Computers
- Rugged and Embedded Computer Systems
- Embedded Flash Storage



Measurement and Automation

ADLINK's measurement and automation product segment (MAPS) is dedicated to providing reliable, top quality products for industrial I/O control, motion control, digital imaging, data acquisition, and modular instrument applications. Our comprehensive portfolio of measurement and automation products, application ready platforms, and easy-to-use software packages, with integrated value-added service, continually meet and exceed customer requirements for industrial automation systems, machine vision systems, and automated test and measurement equipment.

- PXI & Modular Instruments
- Data Acquisition
- GPIB & Bus Expansion
- Machine Vision
- Motion Control
- Distributed I/O
- Fanless Embedded Computers
- PAC

Industrial Mobile Computing

ADLINK's Industrial Mobile Computing Product Segment is committed to offering rugged industrial mobile product solutions, together with mobile operating systems. Applications benefiting from our expertise include logistics management, manufacturing, medical, retail trade, and transportation, especially those requiring use in harsh and demanding environments.

- Handheld Mobile Industrial Devices
- Smart Panels

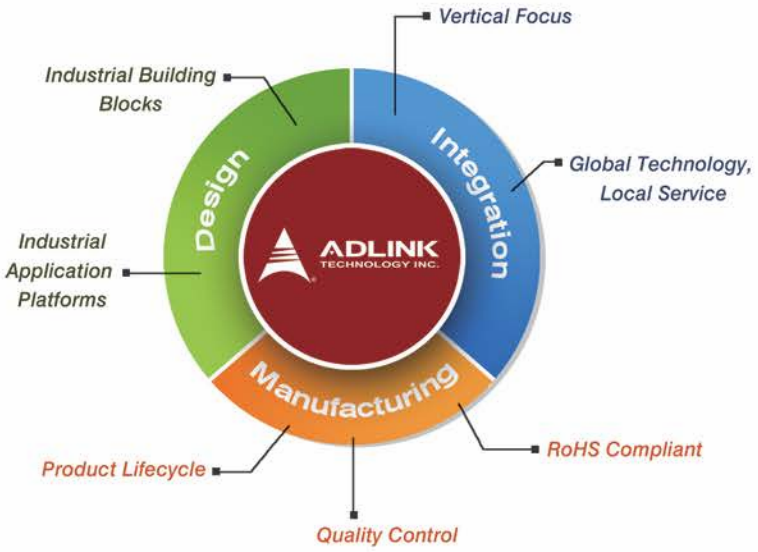
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Design and Manufacturing Services

To fulfill your requirements for high quality, cost-effective products, with quick time to market in product development,ADLINK has established and assembled a Design and Manufacturing Services team to cater to the specific demands that off-the-shelf products can not meet.

From embedded computers, data acquisition cards, and CompactPCI systems to related software packages, our DMS design team has the expertise to rapidly prototype upon the approval of finalized specifications. In addition, the precision of ISO-9001 certification ensures the exactitude of our research and development procedures with the highest product quality.

ADLINK owns and operates the manufacturing facilities in our Asia headquarters. Complete capabilities include our own PCB layout teams, SMT lines, system integration, and test capabilities. In short, ADLINK controls the whole manufacturing process, from layout and design to prototyping and volume production.



Efficient Management

At ADLINK, we are continuously striving for process improvements. Our goal is to offer our partners the best quality products at the best price to performance ratio, along with the superior service synonymous with the ADLINK name. To further ADLINK's continuous process improvement, we have utilized an enhanced ERP (Enterprise Resource Planning) system to provide direct and immediate online information to the factory and productionmanagement. This system has fine-tuned our delivery processes, from manufacturing to the final shipping stage.

Product Life

At ADLINK, we understand the importance of long product life cycles in the embedded market. Every effort is made to select component manufacturers with predictable component life cycles. We work closely with our key component suppliers to obtain early notifications for end-of-life decisions and we require product life statements for critical components.

Repair and Maintenance

ADLINK insists that product returns/repairs are a fast and convenient experience for our partners, irrespective of time of purchase. All RMAs are processed with top priority. Our Worldwide Field Application Teams provide responses within 24 hours to Technical Support and customers can view their product repair status through online RMA tracking.

Customer Service

eRMA

ADLINK customers can send their RMA requests via our eRMA system. After obtaining a RMA number, you can track RMA status online at any time.

Customer Feedback System

This is the place to get help for ADLINK products. 'Ask an Expert' provides answers to commonly asked questions, or you can click on the 'Ask a Question' tab to contact ADLINK's knowledgeable staff about a specific product or issue. The ADLINK AAE (Ask an Expert) is available 24/7 online and is staffed by dedicated professionals who are readily available to address customers' needs and answers questions. All issues and comments are recorded into a database and can be tracked/reviewed at anytime. ADLINK customers are invited to access the system through the Internet:

http://www.adlinktech.com/AAE

Partner Center

The ADLINK Partner Center is specifically designed for worldwide sales and marketing support to allow our global sales representatives and distributors access to real-time product and marketing information and materials as they are released internally at ADLINK headquarters. More than a resource database, the ADLINK Partner Center will also facilitate your business in serving customers.

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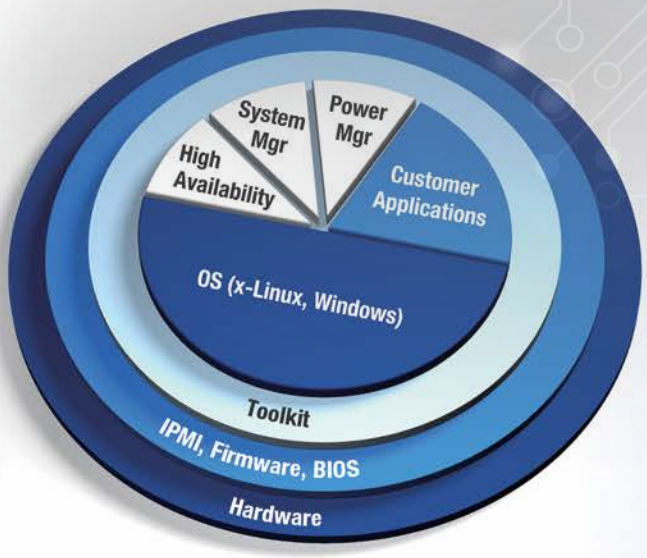
Application Ready Intelligent Platforms (ARIP)

Introduction

Commercial Off-The-Shelf (COTS) products have become commonplace in many domains, including telecom, network and defence, as they can provide standardized functionality and shorter time-to-market at lower cost than custom made solutions. In response to this industry trend, ADLINK has released its own ATCA Application-Ready Intelligent Platforms (ARIPs) to meet the various needs of demanding customers. ADLINK ARIPs are a set of validated integratable building blocks, including hardware, OS, and software components (firmware & middleware).

ADLINK ARIPs provide hardware level integration and validation using building blocks from ADLINK's standard product lines; OS validation performance tuning, and virtualization certification; as well as a variety of toolkits for system & power management and application control including Fastpath modules for data plane and signaling process functions, such as the ADLINK Data Plane Development Kit (DPDK), Media SDK, System Management Toolkit. ADLINK ARIPs also provide Active Power Management, System Management, and Service Availability Framework to enable ADLINK products as a “Green”, “Smart”, and “Robust” platforms.

With ADLINK's proven platforms and applications, customer applications can reduce dependence on lower level services, and enable self forming and self healing capability of final products, thus saving valuable resources to support innovation of products and solutions.



ADLINK Application-Ready Intelligent Platform Architecture

Wi-Fi AP Controller Platform

The ADLINK Wi-Fi AP controller platform is a unified control, management and data plane platform. It is targeted at requirements of 20~40Gbps throughput per blade, and supports 8000 access points (APs) in a compact 6-slot ATCA chassis. To lower costs, a software based chassis management system with redundancy configuration is included. Customized switch software provides wired speed flow classification to distribute packets to each service blade based on pre-configured load balance strategy. Powered by COM Express compute modules, the switch blades can as also handle system management, operations, administration & maintenance (OA&M), and software upgrade.

With all required functions consolidated in an ADLINK intelligent toolkit, the ADLINK Wi-Fi AP controller platform is a Green, Smart, and Robust platform. Firstly, active power management meets system performance requirement with ultralow power assumption, saving on operating expenses for end customers. Secondly, the system management function can predict hardware failure, protects against data loss and improves business continuity with virtualization certification (VMware/KVM). It provides a common solution for "hitless" software upgrades without service interruption; Finally, Service Availability Framework offers customer applications fault tolerance management, redundancy management, and concurrent session data synchronization. So, equipped with hardware failure prediction, virtualization, and service availability framework middleware, this ADLINK ARIP provides a high availability carrier grade platform.

Highlights

- Control, Management, and data planes in a unified platform
- Total 8k AP capacity, 160Gbps throughput in a compact 6 slots chassis, 40Gbps/slot, includes ADLINK DPDK toolkit
- Intelligent platform, active power management, system management and service availability
- Virtualization certified
- Software based chassis management

Components

Hardware

- aTCA-8606 chassis
- aTCA-3420 switch blades, ADLINK Computer-on-Modules
- aTCA-9300 service blades

Software

- ADLINK DPDK and Intel DPDK packages on aTCA-9300
- Flow classification and load balance strategy on aTCA-3420
- Pre-installed and performance tuned OS on aTCA-9300 and COMe module
- ADLINK Intelligent platform software
- Active power management
- Hardware failure prediction
- Virtualization certified and Service Availability Framework
- ADLINK DPDK toolkit



ADLINK Wi-Fi AP Controller Platform

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Deep Packet Inspection Platform

The ADLINK Deep Packet Inspection (DPI) Platform provides traffic awareness, control and protection for complex networks. The ADLINK DPI platform provides layer 2 and layer 3 fast forwarding functions and manages hardware architecture differences to support both ADLINK IA blades with DPDK, and NPU blades, such as the aTCA-N700. Open DPI software modules are enabled in the platform for reference design and performance benchmark testing purposes. The fully programmable platform provides customers with the ability to rapidly and flexibly add features and update their network packet processing solution. With integrated hardware accelerators, the ADLINK DPI platform provides about 20Gbps throughput per blade with regular express, crypto and compress functions.

Highlights

- High throughput, flexible external interface configuration (40G/10G)
- Layer 2, layer 3 ACL, application level flow analysis, flow classification
- Flexible service blade configuration, supports both IA and MIPS platforms
- Common middleware to manage the differences between IA and MIPS architectures for transparent customer applications
- Open DPI enabled on service blades for reference design and performance benchmark testing

Components

Hardware

- 4-core Local Management Processor (LMP) in switch blade to provide high performance system management
- Supports 2 different service blades: aTCA-6250/ aTCA-N700, with hardware accelerators for Regular Expression, Crypto and Compress/Decompress

Software

- ADLINK DPDK and Intel DPDK packages on aTCA-9300
- Flow classification and load balance strategy on aTCA-3420
- Pre-installed and performance tuned OS on aTCA-9300 and COMe module
- ADLINK Intelligent platform software
- Active power management
- Hardware failure prediction
- Virtualization certified and Service Availability Framework
- ADLINK DPDK toolkit



ADLINK Deep Packet Inspection Platform



Video Transcoding Platform

The ADLINK Video Transcoding (VT) Platform supports high density, 3D video streaming services by dispatching streaming data to service blades according to streaming-based load balance strategy. The streaming service blade (aTCA-9300)integrates high performance video transcoding without increased CPU resource loading.

The RTM provides 2 mini-SAS interfaces to provide storage for video content, and 2 10Gbps Ethernet ports to deliver video content to end users through internet. Each blade can also support up to three hard disks to store configuration data, software images and end user data with RAID functionality and database enabled.

Highlights

- 2x mini-SAS (PCIe Gen 3) providing maximum 96 Gbps throughput to external storage; 2/4x 10Gbps Ethernet throughput
- On-board COMe module on switch blade to meet higher performance requirements of system management, reduce costs, and free more slots for service blades
- Database and RAID functions to support large end user data storage requirements

Components

Hardware

- Switch blade (aTCA-3420) with ADLINK Computer-on-Modules
- Service blade (aTCA-9300)
- R6280 with 2x 10 Gbps external Ethernet interfaces, 2 mini-SAS interfaces

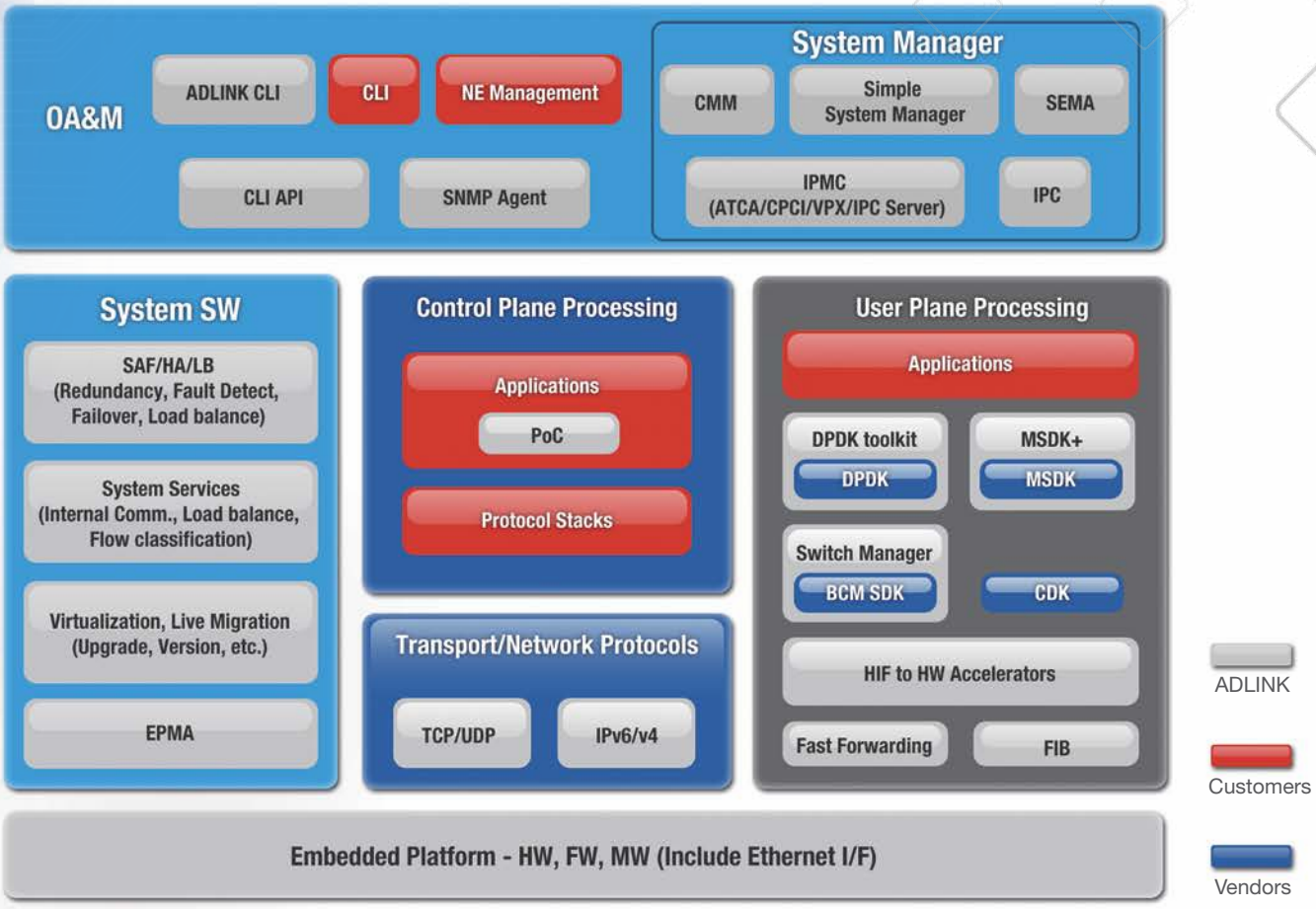
Software

- Load sharing and streaming distribution according to streamingbased load balance strategy
- Verified with mainstream storage as a complete solution



ADLINK Video Streaming Platform

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ADLINK ARIP Software Architecture

Software Products and Services

Customized Switch SDK	Layer 2, layer 3 switching, link aggregation, VLAN setting, ports mirror functions.
L2/L3 Fast Forwarding	ADLINK's L2/L3 Fastpath middleware manages the differences between IA and MIPS processors to provide transparent layer 2 and layer 3 fast forwarding functions, including forwarding tables, ACL, automatically synchronized forwarding from routing tables, and also providing exception paths to operating system and protocol stacks.
HA Middleware	Based on service availability framework middleware to provide HPI and IPMI interfaces and supporting redundancy management, session context synchronization, heart-beat, and fault tolerance alarm management.
Active Power Management	Policy based active power management to reduce power consumption while continuing to meet performance requirements.
Virtualization	KVM and VMware certified, supporting live migration to avoid service interruption during software upgrades, improving service SLA and facilitating easier maintenance.
Operations, Administration & Maintenance (OA&M)	Provides web server, SNMP agent and system management functions for customers to development and integrate system management into their own OA&M system.
Load Balancing	Load balancing using 5-tuple hashing and content distribution flow to service blade group.
Flow Classification	Flow analysis and classification to distribute streaming and flow according to configurable strategy.
Content Inspection	Deep Packet Inspection. Integrated openDPI for feasibility studies, reference designs and benchmark testing.
MSDK	Demux/mux video/audio streams, video transcoding, and provide RTPlibs to encapsulate/de-encapsulate streams into IP network.
Switch Manager	Including layer 2, layer 3 and service level switch functions. Such as port configuration, VLAN, LAG, and STP; static route configuration, RIP, OSPF, and NAT; ACL and other miscellaneous functions.

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Data Plane Development Kit (DPDK)

Consolidating Packet Forwarding Services on the ADLINK AdvancedTCA® Processor Blade with the Intel® DPDK

In recent years, there has been a market and technology trend towards the convergence of network infrastructure to a common platform or modular components that support multiple network elements and functions such as application processing, control processing, packet processing and signal processing. In addition to cost savings and reduced time-to-market, this approach provides the flexibility of modularity and the ability to independently upgrade system components where and when needed, using a common platform or modular components in shelf systems and networks of varying sizes. In traditional networks, switching modules would be used to route traffic between in-band system modules and out-of-band systems; processor modules used for applications and control plane functions; packet processing modules used for data plane functions; and DSP modules used for specialized signal plane functions. By utilizing the Intel® Data Plane Development Kit (Intel® DPDK), Intel® x86 architecture-based processor modules can not only handle traditional processing applications and control functions, but they can also capably and efficiently perform packet processing functions.

Taking IP forwarding as a packet processing example, the ADLINK aTCA-6200A blade combined with the Intel DPDK can provide the required performance and consolidate packet processing services using a single platform. Layer 3 forwarding performance of the aTCA-6200A blade using native Linux IP forwarding without any optimization was compared with that obtained using the Intel DPDK. The reasons behind the gains in IP forwarding performance achieved using the Intel DPDK were analyzed and presented in a white paper. ADLINK's also provides own development toolkit based on the Intel DPDK that allows customers to easily develop their own Intel DPDK based applications.

Intel® DPDK

The Intel® Data Plane Development Kit (Intel® DPDK) is a lightweight run-time environment for Intel® architecture processors, offering low overhead and run-to-completion mode to maximize packet processing performance. It provides a rich selection of optimized and efficient libraries, also known as the Environment Abstraction Layer (EAL), which are responsible for initializing and allocating low-level resources, hiding the environment specifics from the applications and libraries, and gaining access to the low-level resources, such as memory space, PCI devices, timers and consoles.

The EAL provides an optimized Poll Mode Driver (PMD); memory & buffer management; and timer, debug and packet handling APIs, some of which may also be provided by the Linux OS. To facilitate interaction with application layers, the EAL, together with standard the GNU C Library (GLIBC), provide full APIs for integration with higher level applications. The software hierarchy is shown in Figure 1.

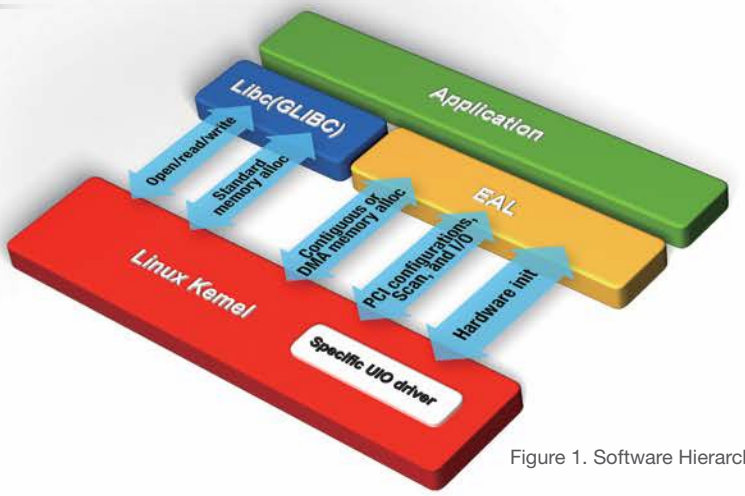


Figure 1. Software Hierarchy

Analysis

The reasons why the Intel DPDK can consolidate more powerful IP forwarding performance than available with native Linux come mainly from the Intel DPDK design features described below.

Polling Mode instead of interrupts

Generally, when packets come in, native Linux receives interrupts from the network interface controller (NIC), schedules the softIRQ, proceeds with context switching, and invokes system calls such as read and write.

In contrast, Intel DPDK uses an optimized poll mode driver (PMD) instead of the default Ethernet driver to pull the incoming packets continuously, avoiding software interrupts, context switching and invoking of system calls. This saves significant CPU resources and reduces latency.

Hugepage instead of traditional pages

Compared to the 4 kB pages of native Linux, using larger pages means time savings for page look-ups and the reduced possibility of a translation lookaside buffer (TLB) cache miss.

The Intel DPDK runs as a user-space application by allocating hugepages in its own memory zone to store frame buffer, ring and other related buffers, that are out of the control of other applications, even the Linux kernel. In the test described in this white paper, a total of 1024@2MB hugepages are reserved for running IP forwarding applications.

Zero-copy buffers

In traditional packet processing, native Linux decapsulates the packet header, and then copies the data to the user space buffer according to the socket ID. Once the user space application finishes processing the data, a write system call is invoked to send out data to the kernel, which takes charge of copying data from the user space buffer to the kernel buffer, encapsulates the packet header, and finally sends it out via the relevant physical port. Obviously, the native Linux process sacrifices time and resources on buffer copies between kernel and user space buffers.

In comparison, the Intel DPDK receives packets at its reserved memory zone, which is located in the user-space buffer, and then classifies the packets to each flow according to configured rules without copying to the kernel buffer. After processing the decapsulated packets, it encapsulates the packets with the correct headers in the same user-space buffer, and finally sends them out to the relevant physical ports.

Run-to-implement and core affinity

Prior to running applications, the Intel DPDK initializes to allocate all low-level resources, such as memory space, PCI device, timers, consoles, which are reserved for Intel DPDK-based applications only. After initialization, each of the cores (or threads, if Intel® Hyper-Threading Technology is enabled in BIOS settings) are launched to take over each execute unit, which run the same or different workloads, depending on the actual application requirements.

Moreover, the Intel DPDK provides a way to set each execute unit running in each core to keep more core affinity, thus avoiding cache misses. In the tests described in this white paper, the physical ports of the aTCA-6200A blade are bound to two different CPU threads according to affinity.

Lockless implement and cache alignment

The libraries or APIs provided by the Intel DPDK are optimized to be lockless to prevent dead locks for multi-thread applications. For buffer, ring and other data structures, the Intel DPDK also optimizes them to be cache aligned to maximize cache-line efficiency and minimize cache-line contention.

Conclusion

By analyzing the results of our tests using the ADLINK aTCA-6200A's four 1GbE interfaces and two 10GbE Fabric Interfaces with and without the Intel DPDK, we concluded that running Linux with the Intel DPDK and using only two CPU threads for IP forwarding can achieve approximately 10 times the IP forwarding performance of that achieved by native Linux with all CPU threads running on the same hardware platform.

The IPv4 forwarding performance achieved by the aTCA-6200A with the Intel DPDK makes it cost and performance effective for customers to migrate their packet processing applications from NPU based hardware to Intel x86 based platforms, and use a uniform platform to deploy different services, such as application processing, control processing, and packet processing services.

However, it is important to note that the Intel DPDK is a data plane development kit running in the user space, and not a complete product that customers can build their applications on directly. In particular, it does not include the implementations required to interact with the control plane, including kernel and protocol stacks.

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the QR code to read the complete article

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Media Software Development Kit (MSDK)

Video Transcoding Performance of the ADLINK aTCA-9300 Blade with the Intel® Media SDK

In recent years, there has been a market and technology trend towards the convergence of network infrastructure to a common platform that supports multiple network elements and functions such as application processing, control processing, packet processing and signal processing. In addition to cost savings and reducing time-to-market, this approach also provides the flexibility of modularity and the capability for customers to independently upgrade system components when and where they are needed by using modular components in a shelf system.

In a traditional network, processor modules are used for applications and control plane functions, DSP modules are used for specialized signal plane or media process functions, packet processing modules are used for data plane functions, and switching modules are used to route traffic between in-band system modules and out-of-band systems. By utilizing the Intel® Media Software Development Kit (Intel® Media SDK), Intel® Architecture-based processor blades can not only perform traditional application and control processing tasks, but also efficiently handle media processing duties as will be discussed in this white paper.

By comparing several video transcoding tasks running on CPU and GPU, ADLINK has demonstrated how to optimize the ADLINK aTCA-9300 blade by using the Intel® Media SDK to offload CPU workload and leverage the GPU hardware to make transcoding much faster and more efficient.

Analysis

A comparison of the maximum real-time transcoding flow numbers between hardware method (GPU with Intel® HD Graphics Media Accelerator interfaces) and software method (CPU only) for video transcoding was made and the results are shown in Figure 3. The results showed that the more difficult the transcoding task is, the more significant the performance gap between hardware and software methods.

For a 1080p transcoding task, the transcoding performance of the hardware method is 8 times better than that of the software method. In performing a low resolution D1 (720x576) H.264 to CIF (320x288) H.264 downscaling transcoding task, the hardware method provides only 3 times the performance of the software method.

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Max RealTime Transcoding Comparison

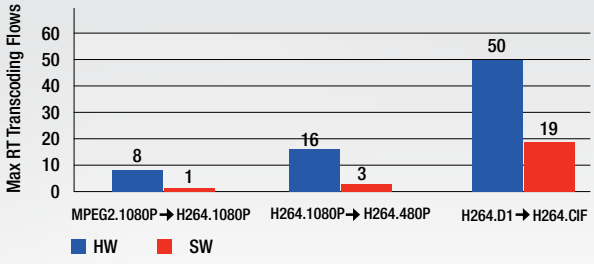


Figure 2: Maximum real-time transcoding flow number comparison

When comparing the maximum CPU usage in real-time transcoding tasks, the benefit from the hardware method becomes apparent. Utilizing hardware transcoding keeps CPU usage to a minimum by invoking the GPU hardware to handle the transcoding. This compares with the software transcoding mode which uses pure CPU capability, resulting in increased likeliness of running out CPU resources (see Figure 3).

Max CPU Usage Comparison

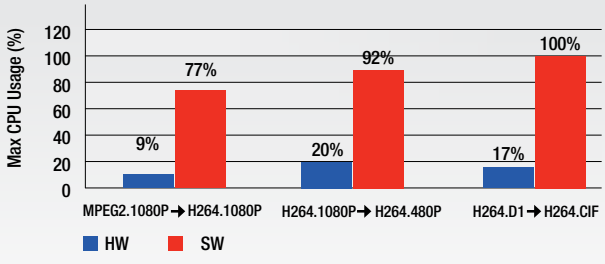


Figure 3: Maximum CPU usage comparison in real-time transcoding

From the performance comparison results, it is clear that the Intel® Media SDK effectively uses the GPU to offload transcoding tasks from the CPU, making transcoding much faster and also resulting in less CPU resource loading. This ability makes merging the control plane and media processing into a single platform a very attractive option. Offloading encoding and decoding tasks from the CPU allows it to focus its resources on control routines and handle its control tasks faster and more effectively.

Conclusion

The ADLINK aTCA-9300 blade can be combined with the Intel® Media SDK to provide effective and efficient transcoding performance and consolidate media processing services using a single platform. In addition, the ADLINK aTCA-9300 is an ideal platform for customers looking for higher capacity and performance at a lower cost. By using such a platform, customers can migrate from their existing rack-mount or blade server systems to the inherent advantages of an ATCA blade system.

All the tests were carried out on Microsoft Windows platforms as Intel has not released its Linux version of the Intel® Media SDK. Generally, most media customers prefer the Linux environment, and we believe that a Linux version of Intel® Media SDK will be well received by a much larger market. If and when it becomes available, we will evaluate the performance of the Linux version of Intel® Media SDK.

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Embedded Power Management Agent (EPMA)

A constant battle being fought by embedded developers everywhere is finding a balance between designing for low power consumption and designing for high performance. Power management and workload consolidation are two areas of technology focus that have emerged to help vendors address this issue.

Reduced Consumption with Policy-based Power Management & Live Migration

There were no surprises in a recent report released by the International Energy Agency (IEA) announcing that energy consumption is steadily rising and will continue to do so in the long-term. The report estimates that global energy consumption will rise by 2.5% annually through 2015, with fossil energy continuing to play a dominant role. And while much of this increased consumption can be attributed to lifestyle advancements in developing countries, the role of first world industry continues to contribute to the world's dwindling energy supply.

According to the annual reports of leading telecommunications operators, the industry is a heavy contributor to the trend in rising energy consumption, with some operators listed as the largest energy-consuming companies in their respective countries. These companies continue to introduce complex information and communications technologies, leading to an ever-increasing amount of peripheral equipment running online and an increased demand on the world's energy supply. As a result of this increased demand, both CO2 emissions and energy costs have risen in parallel, putting operators under long-term financial pressure to reduce their consumption in order to meet corporate social responsibility requirements and/or federal regulations, as well as to improve their bottom line. The continued increase in data demand and faster transfer rates leads to an increasing need for speed provided by communications equipment, which in turn amplifies the overall power consumption of the telecommunications industry.

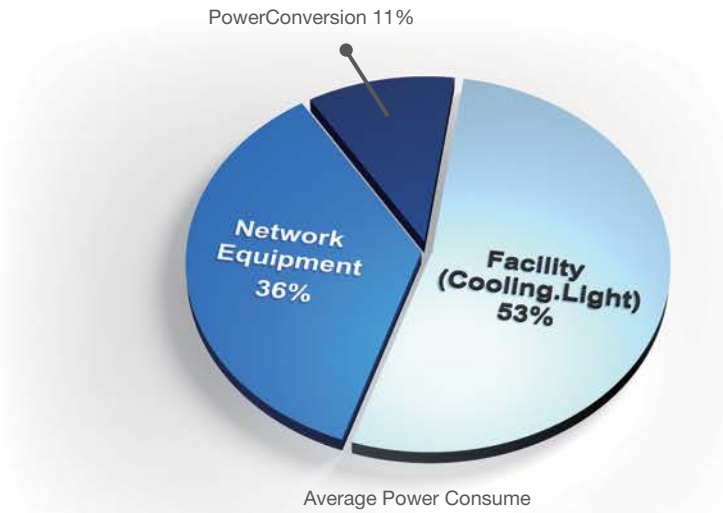


Figure 1. Only about 36% of power is consumed by network equipment, such as servers, storage, and network devices, with most of that most of that power going toward heat production. About 2.4% of total power input is actually used for effective output. Today's vendors offer solutions to improve energy efficiency in ATCA-based network equipment, which also results in improved energy efficiency in equipment facilities and the power conversion process.

Sensible design is essential to thermal management. By reducing CPU usage, power supply output is also reduced, which further reduces the cooling needs within the equipment room. The end result of this cascading reduction is both decreased CO2 emissions and decreased costs associated with cooling due to diminished energy consumption.

Power Management Concepts and Technologies

In terms of the equipment itself, there are several concepts that contribute to reduced energy consumption. Perhaps the best known is processor level dynamic power management, which occurs when a device or system is set into different operating modes: performance, on-demand, power-save, and emergency. With this technology, dynamic voltage scaling and dynamic frequency scaling are used to obtain efficient power management for the processor. With dynamic voltage scaling and dynamic frequency scaling, the processor core voltage, clock frequency, or both can be reduced to decrease power consumption in real time to meet system performance requirements. Power-capping refers to the ability of a system or component to keep its peak power usage below a defined limit by policy-based strategy according to actual service models, including the raw data of CPU usage, concurrent session number, and so on.

ATCA shelf-level power management policies that include virtualization live migration for load consolidation also reduce power usage and related cost/expenses. Live migration allows the server administrator to move a running virtual machine (VM) or application between different physical machines (PMs) without disconnecting the client or application. One of the primary uses of live migration is in resource management in cloud computing, with telecom providers who have thousands of virtual machines (VMs) running in their data centers. To save energy and costs, and for load-balancing, these providers can move VMs using live migration without disrupting customer applications running on VMs.

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Embedded Power Management Software

The topology for power management software is to have multiple system-daemon components, each of which manages one blade, and one client component.

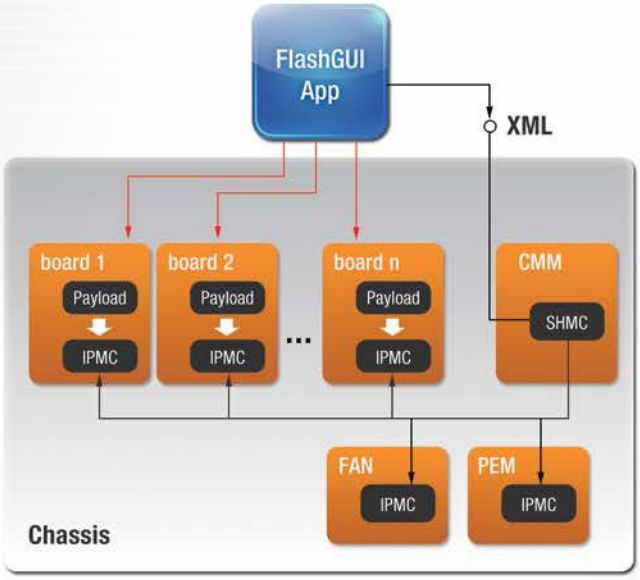


Figure 4: Basic components for implementing embedded power management.

The client collects power-related data on behalf of the power-managed systems. The system-daemon is an application located on each blade that acts as a power management module. It provides CPU, memory, disk drive, network, and virtualization work methods and power-capping functionality to meet performance requirements with the least possible power consumption. The actual management client can run on a desktop or laptop. It consolidates and displays the chassis, board, and sensor (e.g., temperature) information, as well as actual power consumption.

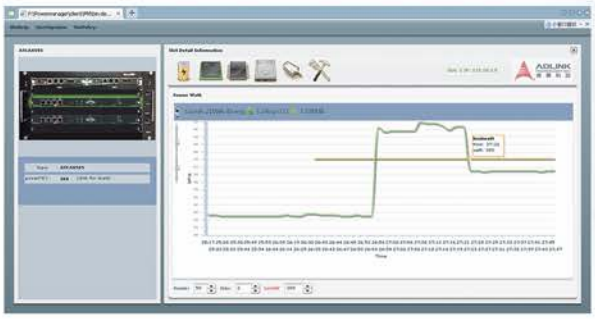


Figure 5: Example of power-capping function.management.



Conclusion

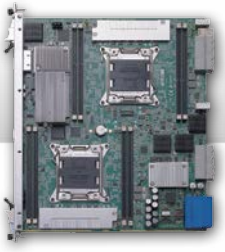
There are many ways to optimize power usage and power efficiency of a multi-board/multi-processor system. We have seen the possibilities using embedded power management, live migration combined with embedded power management, and workload consolidation with throughput optimization. Since the system configurations and workload demands vary case-by-case, there is no generic solution. For each scenario, the techniques and policies to achieve the desired throughput and power consumption must be selected carefully. In the future, power management will remain an important factor for telecommunications operators, as the power density (watt/cubic inch) per system will continue to increase and, with that, intensify the impact on cooling and operational expense.

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New 40G ARIP Product Highlight

Processor Blades





Switch Blades



Model Name		aTCA-9700	aTCA-N700
Product Description		Dual Dual Intel® Xeon® E5-2658 v2 /2680 v2 40 Gigabit Ethernet AdvancedTCA® Processor Blade	Dual Cavium CN6880 packet Processor Gigabit Ethernet AdvancedTCA® Processor Blade
CPU and Core Logic	CPU Support	8-Core Intel® Xeon® E5-2658 v2/E5-2680 v2	Cavium OCTEON II CN6880 32 cnMIPS cores processor Freescale QorIQ P2041 Quad Core processor
	CPU Speed	2.4GHz/2.8GHz	1.5 GHz Max (CN6880) 1.2 GHz Max (P2041)
	CPU FSB	8.0GT/s (Intel® QPI)	N/A
	Chipset	Intel® C604 PCH	N/A
Form Factor		PICMG® 3.0 R3.0 PICMG® 3.1 R2.0 Option1/9	PICMG3.0 R3.0 and PICMG3.1 R2.0 option 3/9/9-KR
Memory	DIMM Slots	Eight DDR3-1866 240-pin (8 channels)	Eight DDR3-1600 240-pin VLP RDIMM sockets
	Max. Memory	128 GB	128 GB
	REG/ECC	REG/ECC	REG/ECC
Display	Graphics Controller	Silicon Motion SM750	N/A
Data Transport		Dual 10/100/1000BASE-T Base Interface channels Four 40GBASE-KR4 Fabric Interface channels Dual 10/1001000BASE-T Egress ports	Dual 10/100/1000BASE-T Base Interface channels Dual 40GBASE-KR4 Fabric Interface channels Quad SFP+ (10G/1G) Egress ports
Storage		Onboard 16G SATA Flash (up to 64G) 2 Channels SAS to RTM	Onboard 2+2 GB dual SSD for LMP Onboard 2+2 GB dule NAND flash for NPU Optional: 2GB bootable Mirco-SD card for LMP
Front Panel I/O		LAN 1/2/, USB 2.0 1/2, COM(mini-USB) 1/2, VGA	One USB 2.0 ports on front panel 3 x RJ-45 serial ports : One for LMP or IPMC & Two for NPs

Model Name		aTCA-3710
Product Description		40GbE AdvancedTCA® Fabric Interface Switch Blade
CPU and Core Logic	CPU & FSB	Freescale QorIQ P2041 (Quad Core) @ 1.2GHz local management processor
	RAM	DDR3-1333 4GB SDRAM
	Storage	Onboard 2+2 GB dual SATA flash
	Bus	N/A
	Management	Serial console port to LMP or IPMC, front panel RJ45 10/100/1000BASE-T, front panel RJ45 USB 2.0, front panel
Form Factor		PICMG® 3.0 R3.0 PICMG® 3.1 R2.0 option 3/9/9-KR/3-KR
Data Plane	Fabric Switch	Broadcom BCM56842 320Gbps Bandwidth Multilayer Switch Optional: pin-to-pin compatible BCM56846 640Gbps Bandwidth Multilayer Switch
	Base Switch	Broadcom BCM56334 24-port Gigabit Ethernet switch with 4-port 10GbE HiGig2 (iPss)
Fabric Interface	Channels	aTCA-3710/640G: 13x 40GbE Interface Channels, for 14-slot system aTCA-3710/320G: 5x 40GbE Interface Channels, for 6-slot system
	Egress	12x 10GbE SFP+, front panel Optional: One 10GbE port to Base Switch (BCM56334) by IC switch
	RTM	N/A
Base Interface	Channels	13x 10/100/1000BASE-T Base Interface Channels, for 14-slot system
	Egress	10/100/1000BASE-T RJ-45 egress ports, front panel
	ShMC Port	2x 10GbE SFP+ egress ports, front panel
	Inter Swtich	2x 10/100BASE-TX ShMC ports compliant to PICMG® 3.0 R2.0 ECN002
10 Gigabit Ethernet Uplink		12x 10 GbE SFP+ ports from Fabric switch(BCM56842/56846) 2x 10 GbE SFP+ ports from Base switch (BCM56334)

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Chassis





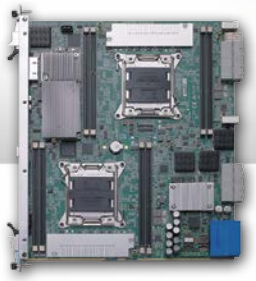
Model Name		aTCA-H8606	aTCA-H8314
Product Description		6U 6-slot Rackmount AdvancedTCA® Shelf	13U 14-slot Dual-Star AdvancedTCA® Shelf
Enclosure	Blade	6 slots for 8U AdvancedTCA® blades (horizontal)	14 slots for 8U AdvancedTCA® blades (virtical)
	RTM	6 slots for 8U AdvancedTCA® RTMs (horizontal)	14 slots for 8U AdvancedTCA® RTMs (virtical)
	Dimensions	449 x 226 x 417 mm (W x H x D)	483 x 577 x 500 mm (W x H x D)
Shelf Manager	Module	Dual-hot-swappable Pigeon Point Systems ShMM-500 based ShMCs (aCMM-2100). Active/ Standby mode for high availability applications	Dual-hot-swappable Pigeon Point Systems ShMM-500 based ShMCs Active/Standby mode for high availability applications
	Management Interfaces	• Remote Management Control protocol (RMCP) • Remote Procedure call (RPC) • Simple Network Management protocol (SNMP) • Command Line Interface (CLI) • Open HPI function support • Web-base interface • Dual-10/100BASE-T Fast Ethernet ports and one serial console for access	• Remote Management Control Protocol (RMCP) • Command Line Interface (CLI) • 10/100BASE-T Fast Ethernet ports and one serial console for access
Backplane	Fabric Interface	Full mesh topology	Dual-star topology, 40Gbps Ready
	Base Interface	Dual-star topology	Dual-star topology
	Update Channel	Update channels for active/standby ynchronization	Update channels for active/standby synchronization
	IPMB	Dual-bussed IPMB	Dual-bussed IPMB
Cooling System		Dual hot-swappable fan tray modules Right-to-left transverse air flow, push-pull design Removable and replaceable air filters	Hot-swappable IPMC controlled fan trays. Easily removable/replaceable air filter
Power Input	DC	Dual redundant -48VDC power entry module (input: -40 VDC to -72 VDC)	Dual redundant -48VDC power entry module (input: -36 VDC to -72 VDC)
	AC	AC to -48VDC power supply built in (AC input: 100~264 VAC, 47~63Hz)	N/A
Weight		10.5 kg	38 kg
PICMG® Spec		PICMG® 3.0 R2.0 ECN001 AdvancedTCA®	PICMG® 3.0 R2.0 ECN001 AdvancedTCA®



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ARIP Product Selection Guide

Processor Blades



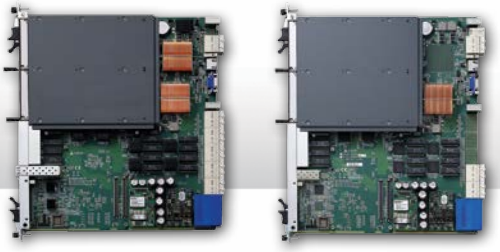




Model Name		aTCA-9300	aTCA-6250	aTCA-6200A
Product Description		Intel® Xeon® E3 Quad-Core 10 Gigabit Ethernet AdvancedTCA® Processor Blade	Dual Intel® Xeon® E5-2658/2648L 10 Gigabit Ethernet AdvancedTCA® Processor Blade	Dual Intel® Xeon® E5-2648L Processor 10 Gigabit Ethernet AdvancedTCA® Processor Blade
CPU and Core Logic	CPU & FSB	Quad-Core Intel® Xeon® E3 1275 V2/1225 V2, Core i3 3220S	8-Core Intel® Xeon® E5-2658/E5-2648L	8-Core Intel® Xeon® E5-2648L
	CPU Speed	3.5GHz / 3.2GHz	2.1 GHz / 1.8GHz	1.8 GHz
	CPU FSB	N/A	8.0 GT/s (Intel® QPI)	8.0 GT/s (Intel® QPI)
	Chipset	Intel® C216 Series	Intel® C604 PCH	Intel® C604 PCH
Form Factor		PICMG® 3.0 R3.0 PICMG® 3.1 Ethernet Over PICMG 3.0 R1.0, Option1/9 PICMG® AMC.0: Advanced Mezzanine Card Specification R2.0 PICMG® AMC.1: PCI Express and Advanced Switching R1.0 PICMG® AMC.3: Storage Interfaces R1.0 PICMG® 3.0 R3.0	PICMG® 3.0 R3.0 PICMG® 3.1 R2.0 Option1/9	PICMG® 3.0 R3.0 PICMG® 3.1 R2.0 Option1/9 AMC.0 AMC Base Specification, R2.0 AMC.1 AMC PCI Express R1.0 AMC.2 AMC Gigabit Ethernet R1.0 AMC.3 AMC Storage R1.0
Memory	DIMM Slots	Four DDR3-1600 240pin VLP UDIMM socket	Eight DDR3-1600 240-pin (8 channels)	Eight DDR3-1600 240-pin (6 channels)
	Max. Memory	32 GB	128 GB	128 GB
	REG/ECC	ECC	REG/ECC	REG/ECC
Display	Graphics Controller	Intel® HD Graphics P4000	Silicon Motion SM750	Silicon Motion SM750
Data Transport		Six 10/100/1000BASE-T Base Interface channels Dual 10G BASEKX4/ 1000BASE-BX Fabric Interface channels Six 10/1001000BASE-T Egress ports	Dual 10/100/1000BASE-T Base Interface channels Dual 10GBASEKX4/ 1000BASE-BX Fabric Interface channels Quad 10/1001000BASE-T Egress ports	Dual 10/100/1000BASE-T Base Interface channels Dual 10GBASEKX4/ 1000BASE-BX Fabric Interface channels Dual 10/1001000BASE-T Egress ports
Storage		On board bootable CFast Socket Two channels SATA to RTM Onboard 2.5” SATA drive (optional)	Onboard 16G SATA Flash (up to 32G) 2 Channels SAS to RTM	CFast card socket Single channel SAS to AMC Bay Dual SAS Channels to RTM Onboard 2.5” SATA drive (optional)
Front Panel I/O		AMC, VGA, LAN1/2/3/4/5/6, USB1/2, COM1	LAN 1/2/3/4, USB 2.0 1/2, COM (mini-USB) 1/2, VGA	LAN 1/2, COM (RJ45), USB 2.0 1/2/3, VGA, AMC

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Switch Blades



Chassis



Model Name		aTCA-3420	aTCA-3150
Product Description		10GbE AdvancedTCA® Fabric Interface Switch Blade	1GbE AdvancedTCA® Base Switch Blade
CPU and Core Logic	CPU & FSB	Freescale® MPC8313E PowerQUICC® II Pro 333MHz control plane processor	Freescale® MPC8313E PowerQUICC® II Pro 333MHz control plane processor
	RAM	DDR2-333 512 MB SDRAM	DDR2-333 512 MB SDRAM
	Storage	64+64MB on-board dual bootable flash memory	64+64MB on-board dual bootable flash memory
	Bus	32-bit/33MHz PCI Bus	32-bit/33MHz PCI Bus
	Management	Serial console port, front panel RJ-45 10/100/1000BASE-T, Zone 3 RJ-45 USB 2.0, Zone3 Type-A	Serial console port, front panel RJ-45 10/100/1000BASE-T, Zone 3 RJ-45 USB 2.0, Zone3 Type-A
Form Factor		PICMG® 3.0 R3.0 ECN002 PICMG® 3.1 R2.0 option 9-K	PICMG® 3.0 R2.0 ECN002 AdvancedTCA®
Data Plane	Fabric Switch	Broadcom® BCM56800 20-port 10GbE multilayer switch	N/A
	Base Switch	Broadcom® BCM56312 24-port	128 GB
Fabric Interface	Channels	13x 10GBASE-KX4 channels, for 14-slot systems	N/A
	Egress	4x 10GbE front panel egress SFP+ ports from AMC-3420	N/A
Base Interface	Channels	Twelve 10/100/1000BASE-T Base; Interface channels, for 14-slot systems	Twelve 10/100/1000BASE-T Base; Interface channels, for 14-slot systems
	Egress	Six 10/100/1000BASE-T and two 10 GbE SFP+ egress ports	Six 10/100/1000BASE-T and two 10 GbE SFP+ egress ports
	ShMC Port	Two 10/100BASE TX ShMC ports compliant to PICMG® 3.0 R2.0 ECN002	Two 10/100BASE TX ShMC ports compliant to PICMG® 3.0 R2.0 ECN002
	Inter Swtich	10/100/1000BASE-T	10/100/1000BASE-T
10 Gigabit Ethernet Uplink		2x 10 GbE SFP+ ports from BCM56312	2x 10 GbE SFP+ ports from BCM56312
Expansion		Two AMC bays, COM Express® module site	Two AMC bays, COM Express® module site

Model Name		aTCA-8214
Product Description		12U 14-slot Dual Dual-Star AdvancedTCA® Shelf
Enclosure	Blade	14 slots for 8U AdvancedTCA® blades (virtical)
	RTM	14 slots for 8U AdvancedTCA® RTMs (virtical)
	Dimensions	449.5 x 531.9 x 383.1 mm (W x H x D)
Shelf Manager	Module	Dual-hot-swappable Pigeon Point Systems ShMM-500 based ShMCs (aCMM-2100). Active/Standby mode for high availability applications
	Management Interfaces	• Remote Management Control Protocol (RMCP) • Remote Procedure Call (RPC) • Simple Network Management Protocol (SNMP) • Command Line Interface (CLI) • Dual-10/100BASE-T Fast Ethernet ports and one serial console for access
Backplane	Fabric Interface	Dual dual-star topology
	Base Interface	Dual-star topology
	Update Channel	Update channels for active/ standby synchronization
	IPMB	Dual-bussed IPMB
Power Input	DC	Dual redundant -48VDC power entry module (input: -40 VDC to -72 VDC) Each carries up to 3000 W (A + B)
	AC	N/A
Weight		33 kg
PICMG® Spec		PICMG® 3.0 R2.0 ECN001 AdvancedTCA®

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