White Paper

Modular Industrial Cloud Architecture (MICA) Flexible, Modular, Open Computing Architecture

ADLINK Technology enables resource allocation on demand to meet key requirements of cloud computing

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Cloud computing calls for a transformation of ICT equipment

ADLINK Technology, as a leading provider of industrial computing platforms, has been focused on the cloud computing needs of industrial equipment for many years. MICA with its open computing architecture, is our answer for meeting these challenges.

With the recent technical advancements of the mobile Internet, data centers and big data processing, cloud computing has become the mainstream service delivery model of the future, transforming the traditional Information and Communication Technologies (ICT) market. The construction of traditional ICT equipment was generally based on old design methodology, which packaged the computing, storage and IO resources into a single physical entity according to the initial maximum demands. The specifications and maximum capacity of computing, storage and IO were determined early in the design process. This often necessitated a redesign of existing equipment to adapt to the requirements of a new application appliance, even with a minor hardware change. A fundamental requirement of cloud computing is "resources on demand," meaning that computing, storage and IO resources can be combined flexibly to meet an application's requirements. Offering resources on demand requires that computing, storage and IO be decoupled into different functional modules in the early design phase. Based on the requirements of a specific application, these independent functional modules are then chosen in the necessary proportions, and combined in a specific hardware entity. The Modular Industrial Cloud Architecture (MICA) from ADLINK Technology was created to realize this concept.

This paper uses video servers and network security appliances as examples to illustrate the challenges facing ICT service providers in constructing the next generation of business applications. Then ADLINK's MICA architecture and its advantages are introduced, followed by a review of new MICA-based products from ADLINK Technology. MICA products meet the requirements of both data center and telecom computing. A series of innovative designs enable service providers to achieve the key requirement of cloud computing - resource allocation on demand - as well as deal with the business challenges arising in the cloud era.

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New ICT equipment is needed to meet business challenges in the cloud computing era

Cloud computing has two notable characteristics: one is that large amounts of data are predominantly video-related, and the other is that computing and data storage takes place mainly in the cloud. The latter makes security a concern for both users and providers. Undoubtedly, video and network security equipment stand at the frontier of industrial ICT equipment transformation.

ICT equipment for video processing: high-efficiency and high-density transcoding is key

Digital video applications have been around a long time, and have changed constantly in response to IT evolution. When the MPEG2 encoding format was born, it was mainly used for DVD video. Today, AVC/H.264 is the mainstream encoding format and is extensively used in Internet video streaming and video conferencing. The newer High Efficiency Video Coding (HEVC)/ H.265 encoding format is attracting more and more attention, and will greatly promote the growth of mobile video and mobile conferencing applications. Advances in video encoding technology reduce storage and transport costs, but at a cost of consuming more computing resources in the encoding and decoding processes. Take for example a comparison of AVC and HEVC: HEVC has a number of improvements compared to AVC, including larger block structures, intra-picture prediction, inverse integer transforms, motion compensation, in-loop deblocking filter, and entropy coding refresh in the encoding pipeline. The benefit is that HEVC offers approximately double the data compression ratio at the same level of video quality, but the drawback is that the required computing resources are increased by nearly one order of magnitude.

HEVC brings both opportunities and challenges to video equipment providers. Taking video conferencing as an example, when AVC encoding is used, a bitrate of 2 Mbps is usually used in order to ensure video quality. If there are 8 people participating in the conference, the required download bandwidth for the video server is 16 Mbps. If 4K video is used in the conference, the required download bandwidth will increase by a factor of 4 to 64 Mbps, which exceeds the available bandwidth for many Internet subscribers, leading to poor quality of experience. However, if HEVC encoding is used, the required download bandwidth is reduced by half, satisfying most IT networks. Increasingly, the mobile deployment of 4G networks worldwide provides the required bandwidth for mobile conferencing and improved user experience. Combined with HEVC encoding, it is now possible to participate in a video conference anytime, anywhere. It is foreseeable that HEVC encoding and 4G networks will be the key development themes of video conferencing in the next few years. Addressing the effectiveness and efficiency of HEVC encoding and decoding will be the biggest challenges in the video conferencing domain.

The application of HEVC is not limited to conferencing, but has significance for two important Internet applications: video on demand streaming and rich media social networking. Although 50 Mbps and 100 Mbps home broadband services are increasingly available, most Internet users are still using 10 Mbps or 20 Mbps services. As a result, most video websites only provide on-demand video streaming in HD (1080p/720p) or SD (480p) resolution. The use of HEVC will make 4K video on demand streaming services more feasible as well as improve the quality of live video streams. The combination of HEVC and other technologies such as Web Real-Time Communication (WebRTC) will make possible social networking via video on any terminal, anytime and anywhere, further transforming social networking services. For such applications, efficient HEVC encoding and decoding are also key requirements, as well as ensuring satisfactory video quality over mobile networks with inconsistent bandwidth.

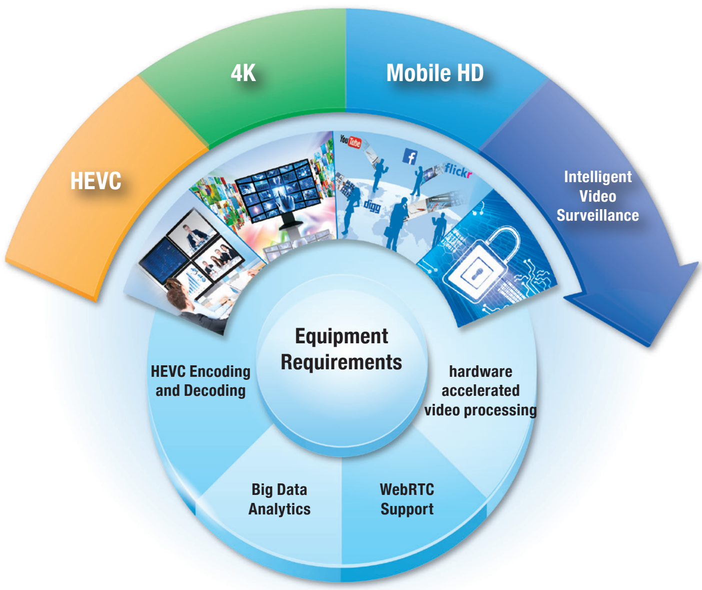

Figure 1. The development trends and new requirements for ICT video equipment

Video constitutes a large proportion of the content consumed daily by populations around the world, and at the same time it has become an increasingly important tool for providing public and private security in the cloud era.

Video surveillance is a key component of most security protection systems and has become increasingly automated and intelligent. Human monitoring of surveillance video is extremely labor-intensive and cannot sustain the increasing volume of collected data. Next-generation intelligent video surveillance systems will run intelligent video analytics software, detect potential safety issues more rapidly and trigger real-time alarms. Furthermore, post-event inspection will become as simple as conducting a video clip search with a keyword. The challenges facing video surveillance providers are to enhance the visual quality of low-quality video via video processing, to improve recognition capabilities, and to index archived surveillance videos using big data processing technology to allow quick and easy searches.

Video is the fastest growing class of network traffic, and the video industry is turning to HEVC, 4K video, mobile HD, and intelligent surveillance for future applications. ICT equipment providers serving the video industry need video servers that can provide economical, fast, efficient and high-density transcoding and analytics services to stay competitive in the coming cloud era.

ICT equipment for network security: DPI throughput and NFV support are key

With the development of the Internet and cloud computing, the manifestation of network security is always changing, requiring greater processing technologies for network security to keep pace with technology evolution.

Take firewalls, for example, which are the most widely used network security devices in the enterprise environment. Traditional firewalls use the port and protocol fields to identify an application and perform attack detection and security protection based on the characteristics of the transport layer. Internet usage has continually evolved since the coining of the term Web 2.0, with mainstream Internet applications adopting the "Web" architecture, resulting in a large of number of applications using a small number of ports for transmission (such as port 80 or 443). In contrast, peer-to-peer and social networking software typically uses a random port, resulting in traditional security protection strategies that are mainly based on port and protocol fields losing their effectiveness. For this reason, the next-generation firewall must use Deep Packet Inspection (DPI) technology to accurately identify applications to execute the appropriate security policy. At the same time, mainstream social networking software has integrated a variety of functions, including communication by text and voice, sending and receiving email, online shopping, gaming, and even file transfers. All these functions are carried out on the same software, but with each function bringing different security risks. Therefore, the next-generation firewall must not only be able to identify an application, but also identify the different functions of an application in order to enforce a more sophisticated and effective security policy.

In the cloud computing era, the enterprise network boundary is becoming increasingly blurred. While enterprises migrate more of their IT infrastructure to public clouds, an increasing number of employees opt to use their own laptops, tablets, and smart phones to handle daily work tasks ("bring your own device" or BYOD). With BYOD they may connect to the corporate networks from untrusted locations such as home, airport or even a customer's meeting room. Therefore, the next-generation firewall must be able to identify a user's identity and location, and then apply a network security policy on this basis. The next-generation firewall should provide options to enforce a security policy for an employee depending on the employee's point of access.

The network Access Control List (ACL) is widely used in a traditional firewall, with IP packet filtering technology requiring by-packet inspection. The ACL rule size significantly affects firewall performance. To improve the performance of next-generation firewalls, it is necessary to adopt a flow status monitoring technique to boost firewall performance. This involves first identifying a service packet using DPI technology, and then determining whether the packet can pass through the firewall and have a flow action enforced on it. Subsequently, when packets belonging to the same service flow arrive at the firewall, the same flow action will be enforced on them directly.

In addition to dealing with known threats based on preset security policies, next-generation firewalls must also be able to use the latest big data analytics techniques to handle advanced persistent threats (APTs) and other unknown threats. APTs are a great concern in the network security industry, as they are extremely stealthy, have diverse means of attack over long durations, and uncertain behavioral modes. All of

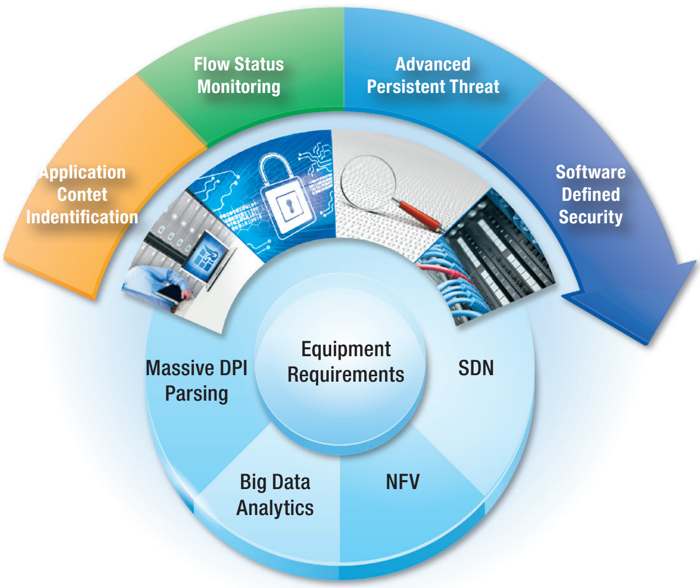

Figure 2. The development trends and new requirements for network security equipment

these characteristics render traditional forms of security methods ineffective in dealing with APTs. The good news is, however, that big data processing techniques provide new options when facing these difficult security issues. First, abnormal event data are recorded in the security domain and big data processing techniques are used to gather them together. Next, the event data are processed using big data analytics to find patterns, relationships and correlations, and the analytics results will provide clues to find a hidden APT threat. In an APT attack, the hacker often spreads malicious software as the first step. Any software that attempts to break down an network will manifest as abnormal malicious actions. Big data processing can be used to track these abnormal actions, distinguish any malicious software, and take defensive action against it to prevent an APT attack at its origin.

Software Defined Networking (SDN) and Network Function Virtualization (NFV) are emerging technologies that present new challenges to the deployment of network security appliances. Traditional network security equipment is manually connected to the network security boundary in a cascading or mirroring mode. In a cloud computing environment that has both physical and virtualized networks, this connection method is no longer applicable as it is difficult to distinguish flow traffic that passes through different virtual machines using physical network equipment. Furthermore, when a virtual machine is migrated to a new host, it may move beyond the protection range of the original physical network security appliance. The result is that the network security appliance is unable to complete its task as expected and becomes the weak link in the security domain. Software defined security is derived from SDN and it uses a logical hierarchical model similar to that of SDN. In the underlying layer, the physical network security appliance is virtualized to a security resource pool. In the upper layer, the business model is implemented by loading different virtualized network security appliances into the security resource pool. When working in the field, software defined security will use SDN to forward the targeted service flow to a virtualized network application, logically achieving deployment and usage of the virtualized security appliances. Therefore, a network security appliance that is suitable for cloud computing needs to have full NFV and SDN support in order to effectively realize network security.

With the development and popularization of cloud computing technologies, traditional network security providers are repositioning and moving their development efforts from network security solutions that can only handle single point security issues to a new generation of network security solution that are effective in big data and cloud computing environments. ICT equipment providers in the network security industry need network security servers that have massive DPI parsing power, full support for NFV and SDN, and a powerful big data processing engine. This equipment must also support dynamic capacity expansion and scalable IO extension in order to adapt to a more complex cloud environment.

Modular Industrial Cloud Architecture: Enabling the transformation of ICT computing infrastructure with flexible and open architecture

At its core, the Modular Industrial Cloud Architecture (MICA) assimilates the latest technologies from Internet data centers, particularly the latest advancements in NFV and SDN. At the same time, MICA integrates aspects of traditional industrial computing equipment, such as modular architectures, hardware-assisted acceleration and carrier-grade design standards. As a result, MICA can bring high performance to the cloud while meeting the industrial computing requirements for flexible expansion, hardware acceleration, and high availability.

Providing a better and faster generation of cloud-oriented ICT equipment relates not only to profitability, but also the survival of enterprises in the next round of competition. Traditional ICT equipment providers are working hard to adapt to these changes, but the challenges they face are more extreme than in any previous generation of equipment upgrades. ADLINK Technology, as a leading provider of industrial computing platforms, has been focused on the cloud computing needs of industrial equipment for many years. MICA, with its open computing architecture, is our answer for meeting these challenges.

MICA: the right solution for industrial cloud computing

While industrial cloud computing has some of the common characteristics of the Internet cloud, it also has some distinct requirements. For example, a network security appliance usually has a larger number of IOs, while a video server must have a video acceleration unit to offload video processing tasks. Therefore, computing equipment designed for Internet data centers usually cannot be used directly in industrial cloud computing applications.

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The first column of Table 1 lists the key requirements of industrial ICT equipment, particularly those for video and network security processing. It is readily apparent that these requirements reflect the latest advances of Internet data centers, and also have a strong relationship with traditional industrial computing requirements. The MICA open computing architecture, proposed by ADLINK Technology, makes it possible to apply the latest NFV and SDN technologies to industrial computing while preserving the key features of traditional industrial computing, allowing video, network security and telecom equipment providers to make the transition to the cloud era with ease and efficiency.

Table 1. Industrial cloud computing requirements and the corresponding MICA implementation

Industrial computing requirement	MICA implementation
Big data processing, mass data transmission, rich IO interfaces	High-density design, providing at least twice the computing density of traditional industrial equipment; Built-in switch or IO expansion cards providing high bandwidth and rich IO
NFV and SDN support	Compute nodes supporting the latest virtual technologies (e.g. Intel® VT-x, VT-d and VT-c); Switch nodes supporting hardware based OpenFlow acceleration; GPU virtualization for cloud video services
HEVC and 4K transcoding, acceleration for video analytics	Integration of the latest hardware acceleration technology for video processing; Support for HEVC/4K transcoding and GPU-based video analytics
WebRTC support, massive DPI parsing	Integrated mainstream open source software and third-party commercial software to create application-ready MICA platforms
Dynamic expansion, high availability, flexible extension	2U, 4U and 10U platforms with scalable computing capacity; Carrier-grade redundancy and hot-plug support; Open architecture and modular design providing rich expansion capability

In the IT industry, whether it be software or hardware, the choice of open or closed solution has been a topic of debate. Both options boast success stories. However, it is indisputable that a closed system must still have external interfaces based on open specifications in order to interface with external third-party systems. It is undeniable that over the past two decades our lives have been changed for the better by rapid advancements in IT technologies, in major part the result of contributions from open source software and open architectures. In the sharing spirit of the Internet, open architectures are beneficial to mutual advancement and collaborative growth, and promote the development of products in a more vital and competitive ecosystem. With this philosophy in mind, ADLINK Technology chose to develop the MICA open architecture for industrial computing platforms. MICA defines detailed specifications for the design of compute/switch nodes, storage, and network and system management modules. In addition, MICA also includes detailed definitions for the design and packaging of specialized industrial modules, ensuring the intercompatibility and intercommunication of MICA modules from different MICA providers.

MICA: a smooth evolution to OCP

The Open Compute Project (OCP) aims to create open source hardware to accelerate the pace of innovation in data centers by emulating the collaborative mode of open source software in order to solve a range of issues including cost, deployment, and maintenance of servers in massive data centers. The principal design goals of the OCP are maximizing data center energy efficiency, improving deployment efficiency, and reducing total cost of ownership and maintenance through standardization and minimalist design. The intrinsic modular concept of MICA makes it possible to combine compute and switch nodes, storage, and IO modules based on specific industrial computing requirements, package them into an OCP tray, and run the system in a standard OCP open rack. The built-in scalable design of MICA allows users to easily add additional storage and hardware acceleration units, even in an OCP tray. The MICA open architecture allows customers a smooth journey to full adoption of OCP in the future, with compute nodes and other main modules that can be reused in the OCP framework, offering protection for hardware and software investment.

The winning advantage of MICA computing platforms

The three key characteristics of MICA are already implied in its name: modular design, industrial features, and NFV and SDN support building a next generation cloud computing infrastructure. In addition, MICA also integrates the necessary hardware acceleration units for hardware processing.

Flexible modular design: Compute, storage, network resources and IO modules can be deployed as needed

MICA adopts an innovative modular and scalable design that allows the user to combine different modules to create a computing platform based on a specific application's needs (see Figure 3). ADLINK Technology provides the commonly-used compute nodes, switch nodes, storage and IO modules that form the basis for a range of MICA platforms for video and network security applications. As an open architecture, if existing MICA modules do not meet a particular application's requirements, the customer can specify a customized MICA framework module and have ADLINK or ODM partner handle the design and manufacture. MICA compute nodes connect to the backplane via high-speed PCI Express buses, providing maximum scalability for users to customize an application-specific module.

MICA also provides an innovative hybrid capability in its modular design by allowing the use of compute nodes with different processors in the same platform, as well as letting customers mix and match between 1/4 and 1/2-width compute nodes in order to scale the number of independent systems in the platform as required by the application. The backplane connector design is taken into account in order to support this hybrid capability and accommodate two different types of compute nodes. The PCI Express bus on the backplane can be grouped and assigned to compute nodes as required, whether they be 1/2-width dual processor nodes or 1/4-width single processor nodes.

The ability to mix and match compute nodes means computing resources can be utilized more efficiently. For example, the computing requirements for control plane and data plane are quite different, with the latter usually requiring higher processing performance. As an example, in a MICA platform, the less complicated control plane tasks can be assigned to a Intel® Xeon® processor E3 compute node, and more complicated data plane tasks can be assigned to a dual Intel® Xeon® processor E5 compute node to achieve more effective utilization of computing resources. MICA is also advantageous in hybrid NFV deployment scenarios when an application requires both physical and virtualized computing environments simultaneously. The physical computing tasks can be deployed on a Intel® Xeon® processor E3 node, and those requiring a virtualized computing environment can be deployed on a dual Intel® Xeon® processor E5 node.

Industrial-grade design enables reliable MICA platforms

MICA is designed to meet industrial cloud computing requirements in addition to supporting the latest data center technologies, and taking the specific requirements of carrier grade ICT equipment into consideration. For example, all compute nodes, switch nodes and storage modules are designed to be redundant and hot-swappable. Combined with appropriate high availability middleware, Hot standby and failover can be achieved for the "five nines" requirement of telecommunications. MICA IO modules support advanced LAN bypass features, and the bypass modes of each IO module can be set independently through BIOS or an IPMI interface.

For the high bandwidth requirements of network security and DPI-based applications, each MICA compute node can support 64G dual channel communication links to redundant switch nodes, and additional bandwidth requirements can be achieved through the use of network IO cards. A single MICA compute node can support a maximum communication bandwidth of up to 480G. In conjunction with Adlink's PacketManager, vSwtich and NFVi software platform, the computing power and IO capabilities of a compute module can be maximized, achieving higher-density packet processing. Compared with a traditional data center server, MICA used in a cloud environment must provide not only higher bandwidth, but also a richer set of network interfaces, yielding a wider range of network interface modules supporting 1G/10G communications with both optical and electrical interfaces.

NFV and SDN support to meet the core requirements of cloud computing

NFV technology can divide one physical appliance into multiple virtualized machines that are logically separated from each other, meeting the requirements for equipment rental scenarios in a cloud environment. Proprietary devices are replaced by virtualized equipment and the virtualized network functionality can be deployed where needed. Meanwhile, computing, storage, and network resources can be allocated dynamically based on real-time demand, achieving optimal equipment utilization. In addition to supporting Intel® Virtualization Technology (VT-x, TV-d and TV-c), MICA also includes support for GPU virtualization for video processing, enabling the sharing of GPU resources among multiple virtual machines, and assisting in the deployment of subscription-based video services such as video conferencing, Internet set-top boxes, and virtual desktops.

SDN technology, which is used to separate the control plane and forwarding plane, can improve data flow manageability in a cloud environment. Together with NFV technology, SDN can help implement the allocation of network resources on demand, enabling flexible network deployment, imposing finer QoS control of the service data flow, meeting the requirements for a satisfying end-to-end service experience and efficient network operation. MICA switch nodes adopt the latest switch chipset technology technology, which uses a larger TCAM table, and can implement L2/L3/L4 forwarding based on OpenFlow protocol, meeting the requirements for software defined flow forwarding.

Hardware acceleration design allows MICA to use computing resources more efficiently

MICA is designed for industrial ICT computing and can speed up network packet and video processing using the latest hardware acceleration technologies. For NFV, MICA switch nodes support hardware-based acceleration for the processing of Network Virtualization using Generic Routing Encapsulation (NVGRE) and Virtual Extensible LAN (VXLAN), benefiting the construction of a large layer 2 network in a cloud.

For network packets, MICA compute nodes use the acceleration engine in the network controller to implement load balancing and packet filtering against the input data flow without taking up CPU resources. By integrating IO modules that use chipsets with Intel® Quick Assist Technology, MICA can also offload compression/decompression, or encryption/decryption processing tasks to the IO module. For video processing, MICA can take advantage of the Intel® Quick Sync Video acceleration unit embedded inside supporting processors, boosting video encoding/decoding and video analytics performance. The introduction of these dedicated hardware acceleration units not only speeds up these computationally intensive tasks, but also offloads CPU resources that would otherwise have been dedicated to these tasks, allowing the computing resources to be used more efficiently in a MICA platform.

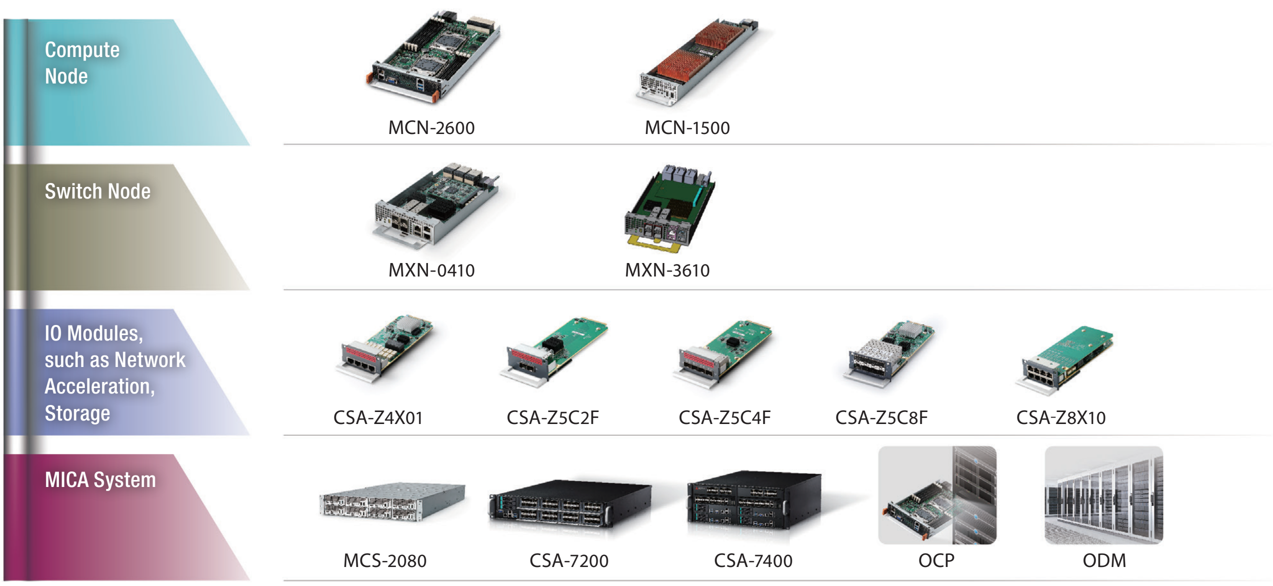

Figure 3. Modular design implemented in MICA platforms

Application Ready Intelligent Platforms for industrial computing

Cloud computing is not only influencing the design and development of industrial computing hardware, but also transforming software for industrial applications. Due to the adoption of emerging technologies such as NFV, SDN, big data processing, HEVC and WebRTC, software development costs are exceeding acceptable levels for most small and mid-sized enterprises. The software engineering model for a cloud application is evolving away from that of traditional applications. Traditional software, usually built bottom-to-top, including board support package, support level middleware, and application level software, is becoming outmoded and intractable for most developers of enterprise cloud software. ADLINK's MICA architecture supports Application Ready Intelligent Platforms (ARIP), where the infrastructure layer software manages SDN/NFV and other foundation services provided together with the hardware. Using ARIPs from ADLINK, customers will not need to expend effort on the infrastructure layer software, and can focus on the development of more value-added application level software.

Infrastructure software makes MICA application ready

ADLINK provides MediaManager and PacketManager software on MICA platforms for video processing and network packet processing, respectively. MediaManager software is designed to help customers develop end-to-end video related applications, providing audio/video multiplexing/de-multiplexing, RTP stream sending/receiving and video composition functionality, as well as application prototypes for video streaming on demand, video conferencing and video analytics. MediaManager helps customers take advantage of the hardware acceleration capabilities of the GPU, and develop video applications more easily and quickly on MICA platforms. PacketManager software is designed to help customers develop network packet processing-related applications, providing the conventional layer 2 and layer 3 features, as well as functions for flow-based forwarding, load balancing, compression/decompression and encryption/decryption on network packets.

In addition to considering the hardware requirements for SDN and NFV support in MICA platform designs, ADLINK has a fully integrated NFVi software infrastructure from Wind River and also integrates and validates mainstream open source and 3rd party software in advance. This reduces R&D costs and time to market by reducing the porting efforts required from the customer. To support SDN, ADLINK integrates Intel® DPDK and Open vSwitch on MICA compute nodes, and will enable the OpenFlow support on MICA switch modules in the near feature. To support NFV, ADLINK integrates OpenStack and Wind River® Titanium Server software into its MICA platforms and also provides VMware virtualization certification, giving customers a choice between open source and commercial virtualization middleware.

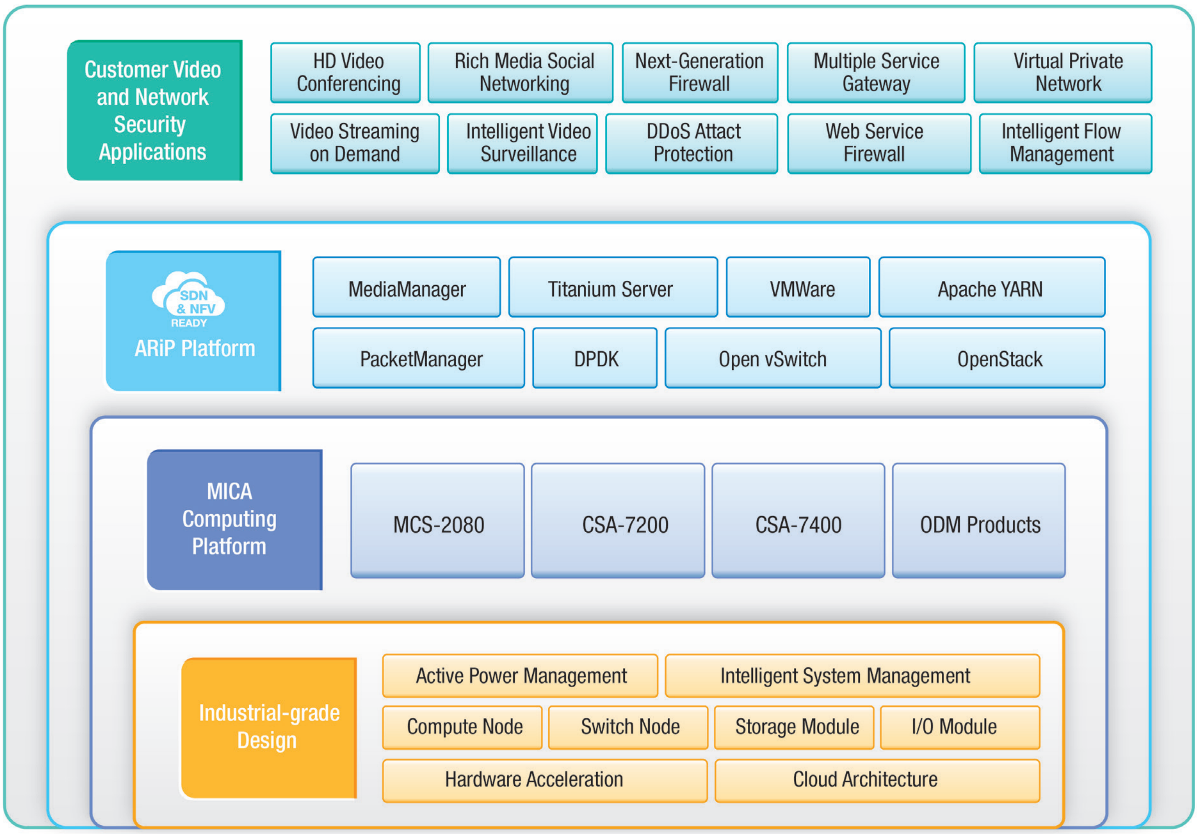

Figure 4. Application Ready Intelligent Platforms from ADLINK

IPMI-based management makes MICA an intelligent system

Systems deployed in data centers gain many benefits from remote system management based on the IPMI specification. MICA platforms have built-in, out-of-band system management functionality that is compatible with IPMI 2.0. Users can monitor the operational status of the entire system remotely, easily accessing information such as board temperature and voltage readings, LAN bypass status, fan speeds and power consumption. Intelligent system management allows for more reliable system operation and also provides a convenient way to locate and repair system problems. For example, the BMC Sensor Event Log (SEL) can be retrieved to diagnose a system problem, or the system administrator can access BIOS setup and change the BIOS configuration remotely using the Serial Over LAN (SOL) function during the pre-boot phase. Furthermore, the entire boot process of a Linux console can be monitored remotely via SOL, and a remote reset and power cycle can be triggered when necessary.

Active power management makes MICA energy-efficient

When industrial computing is migrated to the cloud, energy efficiency becomes a key factor in measuring the quality of a product. In addition to utilizing compute nodes with high-performance, low power consumption embedded processors, and powering down idle nodes through virtual machine migration during idle periods to reduce power consumption, MICA also enables active power management based on Intel® Node Manager technology. The following power management features can be achieved on MICA:

- For compute nodes, the current power consumption, historical maximum, minimum and average power consumption can be read.
- Complete system power consumption can be read from the PSU via an IPMI interface.
- Limiting the power consumption of a compute node to a set value, as well as setting a trigger condition for power limiting; for example, when the air inlet temperature exceeds a certain threshold, or as soon as the node is powered on.
- Setting the valid periods of a power limit policy; for example, restricting power limiting to idle periods at night.
- When a preset power limit policy cannot be achieved, a preset action can be executed on the system; for example, shutting down the node or sending an event alert to the system administrator.

MICA platform applications

Originally, MICA was intended as a new hardware architecture for the next generation of video servers and network security appliances. However, with its carrier-grade design and SDN/NFV support, MICA is also a good candidate for building the next generation of elements in LTE-Advanced or 5G networks.

MICA platforms for video processing and network security

- Video Processing: The ADLINK MCS-2080 Media Cloud Server puts first priority on video processing capability and is well suited for building next-generation cloud-based video applications such as video streaming on demand, intelligent video analytics, high definition video conferencing and rich media social networking.
- Network Security and DPI Processing: The ADLINK CSA-7200 and CSA-7400 are designed specifically for network packet processing capability and IO density, and are well suited for building next-generation network security appliances for high-performance firewalls, DDoS attack prevention, web service firewalls, multiple service getaways, APT security protection and BYOD security protection. Along with security, applications requiring enhanced processing, low latency and I/O options can greatly benefit from the MICA-based CSA-systems.
- Telecom Computing: MICA platforms empowers telecom network elements to manage big data processing, deploy virtualized network functionality, and provide mobile edge computing.

ADLINK MICA products are available as COTS products or as an ODM service. Standard MICA products are built to meet the common needs of cloud-based video processing and network security processing. MICA ODM services allow customers to build customized platforms using standard MICA modules. The following sub-sections describe ADLINK MICA COTS platforms in more detail.

MCS-2080

2U 19" Media Cloud Server

The ADLINK MCS-2080 is a so-called "3m" platform with the m's standing for modular architecture, designed for media, and mass data processing. The MCS-2080 leverages MICA's hybrid design for compute nodes, supporting the installation of either eight 1/4-width dual-system dual-processor nodes (Intel® Core™ i3/i5/i7 processors or Intel® Xeon® processor E3), or four 1/2-width single-system dual-processor nodes (Intel® Xeon® processor E5), or a combination of both. The Core™/Xeon® processor E3 systems have built-in hardware acceleration units for video processing and are suitable for handling video transcoding and analytics tasks. The Intel® Xeon® processor E5 systems provide high performance computing especially suited to big data tasks. The main features of the MCS-2080 are summarized as follows:

- 16 systems (MCN-1500 compute node) or 4 systems (MCN-2600 compute node), hybrid combinations supported
- Intel® Quick Sync Video technology with hardware assisted H.265/VP9 transcoding
- Built-in dual redundant switches, each providing 16x1G internal links to compute nodes and 4x10G uplinks
- Eight PCIe x8 slots to meet expansion requirements
- Support for IPMI 2.0 specification to provide web-based intelligent system management and support for SOL on compute nodes
- Adaptive fan speeds to reduce the fan noise and power usage while ensuring system health
- Dual redundant power supply units with power health monitoring and abnormal situation alert via IPMI interface
- Support for MediaManager to provide prototyping for frequently used video server functions to speed up product development
- Support for open source software from OpenStack and Apache YARN ecosystems, a big data-ready platform

CSA-7200

2U Network Security & DPI Platform

The ADLINK CSA-7200 is designed as a next-generation network security appliance, featuring high-performance dual Intel® Xeon® processors E5 and up to 64x 10G SFP+ ports through eight network interface modules. The main features of the CSA-7200 are summarized as follows:

- Flexible IO interfaces through eight network interface modules (NIMs) adaptable to a variety of complex connectivity scenarios
- Advanced LAN bypass features; bypass modes of each NIM can be set independently through BIOS or IPMI interface
- 12x DDR4 memory slots for up to 192GB memory to meet the requirement of network packet processing
- 3x 2.5" hot-swappable SATA drive bays, supports additional storage expansion via PCIe or M.2
- Intelligent system management compatible with IPMI 2.0, supports SOL and adaptive fan speeds
- Support for PacketManager software to provide data plane software stacks for dynamic layer 3 forwarding and flow-based forwarding, accelerating development of customer applications
- Integrates Wind River® Titanium Server, and open source software including Intel® DPDK, Open vSwitch and nDPI, facilitating the building of packet parsing applications

CSA-7400

4U High-performance Telecom Platform

The ADLINK CSA-7400 is a high-performance high-density computing platform supporting four dual Intel® Xeon® processors E5 compute nodes, interconnected by dual redundant switch modules. The CSA-7400 can ensure uninterrupted service delivery through hot-swappable compute nodes and switch modules. It is ideally suited for building next-generation high-performance firewalls and virtualized telecom elements. The main features of the CSA-7400 are summarized as follows:

- Supports four single-system dual Intel® Xeon® processors E5 compute nodes (MCN-2600)
- Dual redundant switch modules provide 40G internal links to each compute node, and 360G uplinks
- Support for hardware based acceleration for processing NVGRE and VXLAN, assisting the construction of large layer 2 networks in the cloud
- Support for IPMI 2.0 specification, web-based intelligent system management, and support for SOL on compute nodes
- Dual redundant power supply units provide active power management on compute nodes, support flexible power limit polices
- Support for PacketManager software to provide data plane software stacks for dynamic layer 3 and flow-based forwarding, accelerating development of customer applications
- Optional integration of Wind River® Titanium Server software to provide carrier grade NFV service
- Support for hardware acceleration for Open vSwitch and OpenFlow protocol processing, accelerating SDN services

Conclusion

Traditional industrial ICT equipment providers are facing a transformation of technologies and paradigms with the advent of cloud computing, and only those with the courage to embrace the challenge through constant innovation can achieve success in this new round of competition. The MICA open architecture for cloud computing created by ADLINK is designed to accommodate the new trends in ICT equipment, combining the requirements of both data center computing and carrier grade industrial equipment. MICA integrates several innovative design components, including modularity and full virtualization support, which are aimed at meeting the key requirement that resources are allocated on demand in the cloud and providing a strong foundation for building the next generation of cloud-based industrial computing services.

In the cloud computing era, software engineering concepts are profoundly affected by the abstraction of traditional functions into "Software-Defined Everything.". In order to stand out from the crowd, ICT equipment providers must invest their precious development resources in application-level software and exhibit their core competencies through constant innovation in applications and services. By leveraging MICA ARIPs from ADLINK Technology, ICT equipment providers can quickly build next generation video, network security and telecom applications, making a fast and efficient transition to the cloud.

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IoT Solutions Alliance
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ADLINK Technology is a Premier member of the Intel® Internet of Things Solutions Alliance. From modular components to market-ready systems, Intel and the 400+ global member companies of the Intel® Internet of Things Solutions Alliance provide scalable, interoperable solutions that accelerate deployment of intelligent devices and end-to-end analytics. Close collaboration with Intel and each other enables Alliance members to innovate with the latest technologies, helping developers deliver first-in-market solutions. Learn more at: intel.com/iotsolutionsalliance

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