AdvancedTCA Eco Modular

MODULAR SYSTEM FOR BROADCASTING APPLICATIONS

WITH THE INTRODUCTION OF HD VIDEO BROADCASTING, PROVIDERS HAD TO PREPARE THEMSELVES BY UPGRADING THEIR SYSTEMS AND EQUIPMENT IN ORDER TO MANAGE THE INCREASED AMOUNT OF DATA. A GROWING DEMAND FOR HIGHER RESOLUTION AND VIDEOS ON DEMAND, HAS PRESSURED THE BROADCASTING INDUSTRY INTO BUILDING HIGHLY SOPHISTICATED INFRASTRUCTURE THAT MEETS BANDWIDTH AND PERFORMANCE REQUIREMENTS.

The telecom industry has faced similar challenges in the past with the evolution of the word wide web. The amount of data transfer around the world increases continuously. In order to address these changes, the standardization organization PICMG introduced nVent SCHROFF AdvancedTCA, the extremely sophisticated and robust system management architecture delivering a platform with a high level of availability and bandwidth.

When the PICMG AdvancedTCA specification was released in 2003, the performance requirements were much lower than the demand seen today. The maximum power consumption per blade was defined with 200 W and 15 W for the RTM module. Since then the demand for power per blade has increased significantly. The next generation of shelf could cool about 250 W per blade. The demand for power continued to increase, so by 2010 shelves with 300 W cooling capability were on the market. Board vendors installed active components on the RTM boards which needed up to 30 W per RTM board. At that time, broadcasting companies found in this technology a platform for their increasing infrastructure needs. Digital data transfer increasingly became one of the core functions in this industry. High resolution broadcasting demands high performance blades with an increased power consumption up to 400 W and 50 W for the RTM. The race in the high performance market continues.

HIGH PERFORMANCE SHELVES ARE AVAILABLE TO SUPPORT THOSE NEEDS

The infrastructure of the system, including cooling, needs to be designed to guarantee a proper power supply and distribution as well as the heat dissipation of 450 W per slot. There are already discussions about doubled-width boards dissipating more than 1 kW of power.

AdvancedTCA is designed for these high performance applications driven by a few tier-1 Telecom and Datacom TEMs. At that time, system availability of 99.999% played a more significant role than the performance level of the system, but the market is getting broader and new users are adopting AdvancedTCA as their future platform. With new applications in this market, new requirements and challenges arise. What all applications and markets have in common is the sensitivity to cost. More and more system operators are satisfied with a feature set optimized to fit their application, optimizing costs at the same time. Many new applications where AdvancedTCA could have been selected have a lower feature requirement than the fully redundant standard AdvancedTCA offering.

SCHROFF AdvancedTCA Eco Modular

Redundancy is still an important requirement, especially for broadcasting applications. The level of redundancy can be optimized to precisely fit the demand the application requires while achieving cost targets.

The reason for redundancy is fairly simple. There is a small risk that components used in such high availability systems may fail over a certain time. Since AdvancedTCA has been proven in the telecom market for over 10 years, users as well as system manufacturers were able to experience the reliability of the ATCA systems. This insight gained over the years also provided an understanding for the type of component redundancy needed. Redundancy does have a positive impact on reliability, but it also has a huge impact on cost. Customers not only demand a reliable but also a cost-efficient solution that meets all requirements.

To address these demands, nVent has released the nVent SCHROFF AdvancedTCA ECO Modular chassis. ECO Modular follows the modular approach to specify a chassis with an optimized feature set for specific cost sensitive needs. ECO Modular is a 14 slot, 14 U AdvancedTCA shelf with a modular selection of features. These features can be removed or added as needed, cooling and power feed capability can be easily adjusted and the main focus in development was to optimize cost with keeping the high performance level.

COOLING: SIMPLE AND EFFICIENT

A proper cooling performance is absolutely mandatory to protect the application and ensure the reliability of a system. Heat always has a negative impact on component lifetime. Furthermore, a lot of different issues like ambient temperature, airflow impedance of the installed ATCA blades or the varying air velocity within the individual slots may influence cooling performance of the complete system. In order to get comparable and representative measurement results, PICMG defined a specific test procedure and the necessary tools to determine the cooling performance.

nVent performs various tests to verify cooling performance of SCHROFF systems. Air flow volume is measured in a thermal lab and is one indicator for heat dissipation of a system. This measurement is done with special front flow measurement boards containing twelve temperature sensors positioned in the midline of the board. Test results indicate exact air volume in four zones on the boards to help board designers identify hot spots. Any impacts of different air drag characteristics can be simulated with various reference boards or air filters.

The first AdvancedTCA chassis with 200 W to 250 W per blade were 12 U high. To get to 300 W per blade the chassis height had to be increased to 13 U. Today, 450 W per slot shelves are 14 U in height. Higher cooling performance can be achieved in using stronger fans with a higher rotation speed. More cooling requires even greater airflow volume. The air inlet and outlet have to be increased to get more air through the chassis. Today's 450 W per slot chassis are at least 14 U high and have a push/pull cooling concept. There are two fan trays in the chassis —one below and one above the card cage. Those two fan trays guarantee high air pressure through the slots to counteract the very high air

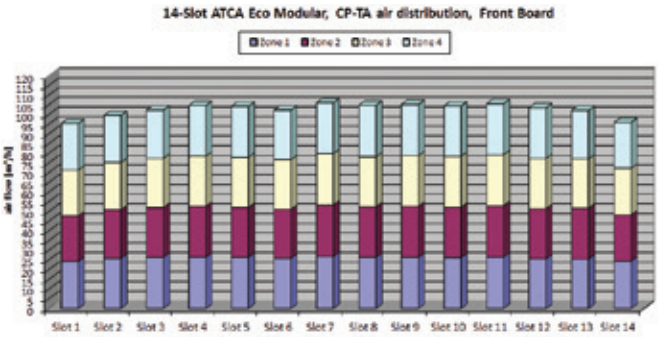

Table 1: Measurement results of ATCA ECO Modular

Image1: SCHROFF ATCA ECO Modular chassis from nVent

resistance of the blades. The most limiting factor in those chassis is the height. A relatively small air inlet and outlet section adds a high air impedance and require high-performance fans to push sufficient air through the chassis.

The ATCA ECO Modular uses only one fan tray with eight standard fans delivering 450 W cooling performance per blade. With the elimination of one of the fan trays, additional space can be used to increase the air inlet. With eight higher performance fans installed in the fan tray the cooling capability exceeds 500 W per blade. If only 6 standard fans are installed, the chassis still has a cooling capability in excess of 250W per blade. By using standard, modular fan tray options, the cooling performance and cost of ECO Modular can be adapted to the requirements of the application.

Even with the lack of redundancy from using a single fan tray, an individual fan failure will not cause overheating of blades in a properly optimized chassis. The single ECO Modular chassis fan tray is installed below the card cage and is directly connected into the backplane. It has a large air inlet section and the fans are mounted at a slight angle, allowing air flow through cutouts in the backplane to cool the RTMs. The telco alarm panel and two RJ-45 connectors for the shelf manager console ports are located on the fan tray front panel. The shelf supports options for SCHROFF shelf managers installed in slot 15 or for on-blade shelf management. The ECO Modular also includes

an autonomous mode allowing operation of the system without a shelf manager installed. In autonomous mode, the fan controller monitors the air inlet and exhaust temperature, adjusting the fan speed accordingly. The air filter in traditional AdvancedTCA chassis is located on a front removable tray. In the ECO Modular chassis, the air filter is part of the fan tray. The filter holder has large perforations for optimum air flow.

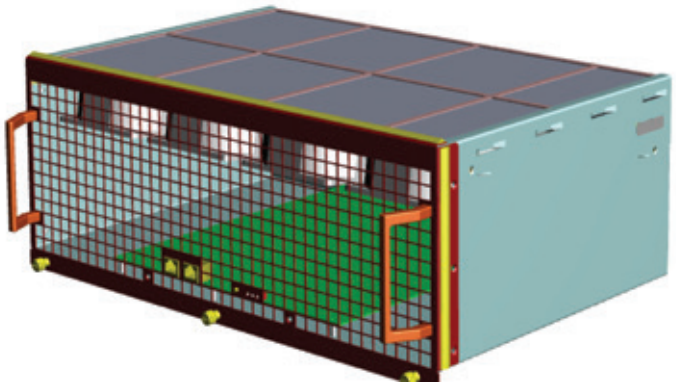

Image 2: ECO Modular fan tray with integrated air filter

SCALABLE POWER ENTRY

During development of the ECO Modular chassis, reliable power distribution at an optimized cost was a primary goal. The modular concept of the power entry supports either 250 or 500 W per slot and either non-redundant or redundant power entry. nVent developed a PEM board with two circuit breakers, each with a capacity of 50 Amps. Power filtering is included in this board. On request, the circuit breaker and filtering features can be removed to optimize the solution as the application demands. For a non-redundant 250 W per slot requirement, only one of these PEM boards will be assembled. For either redundant 250 W per slot, or non-redundant 500 W per slot, two of the PEM boards are installed. For the redundant 500 W per slot version, four PEM boards will be specified. The PEM boards are assembled in the required configuration in a single module at the rear of the chassis. The PEM doesn't have management functionality and is not hot swappable, but can easily and be replaced.

BACKPLANE OPTIONS

Two standard backplane options are available for the ECO Modular chassis; a dual-star, and a Dual-Dual Star version. Both backplanes comply with the IEEE 40GBase-KR4 requirements, which is Ethernet with a data transfer rate of 10 Gbps per port and four ports per channel. This adds up to 40 Gbps in between blade and switch (often named 40G backplane). In a Dual-Dual Star backplane, four switches are used, therefore data can be sent over two switches in full redundant mode which then adds up to 80 Gbps. If the switches are configured for 3 + 1 redundancy, 120 Gbps data traffic in between the blades is possible. The IPMB management bus on both backplanes is bussed.

Additional backplane topologies are available upon request, including 100G backplanes.

OPTIMIZING PERFORMANCE AND COST

The SCHROFF ECO Modular AdvancedTCA chassis is designed in a way such that it can easily be adapted to a large range of customer requirements, covering all cooling and data transport performance classes. ECO Modular allows features such as redundancy, cooling performance, PEM performance and many more to easily match application demands and providing quality and reliability. nVent will offer the AdvancedTCA ECO Modular off-the-shelf in two stock configurations with all other modular configurations assembled to specification.

Image 3: ECO Modular PEM, redundant 500 W / blade version

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ABOUT ENCLOSURES

Electrical systems come in all shapes and sizes, from massive industrial controls to single components. nVent offers a comprehensive range of enclosures that house these vital assets. Marketed under the nVent HOFFMAN and SCHROFF brands, our enclosures offer two-pronged protection: safeguarding electrical equipment from the operating environment and people from electrical hazards. The nVent SCHROFF brand includes server cabinets, data center cooling solutions, power supplies and subracks and cases.

ABOUT NVENT

At nVent, we believe that safer systems ensure a more secure world. We connect and protect our customers with inventive electrical solutions. nVent is a $2.1 billion global company that provides enclosures, electric heat tracing solutions, complete heat management systems, and electrical and fastening solutions. nVent employs 9,000 people worldwide.

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