

CONNECT AND PROTECT

Application Stories: How to Protect and Connect Sensitive Electronics

How nVent SCHROFF has worked to connect and protect high performance electronics packaging solutions for our customers


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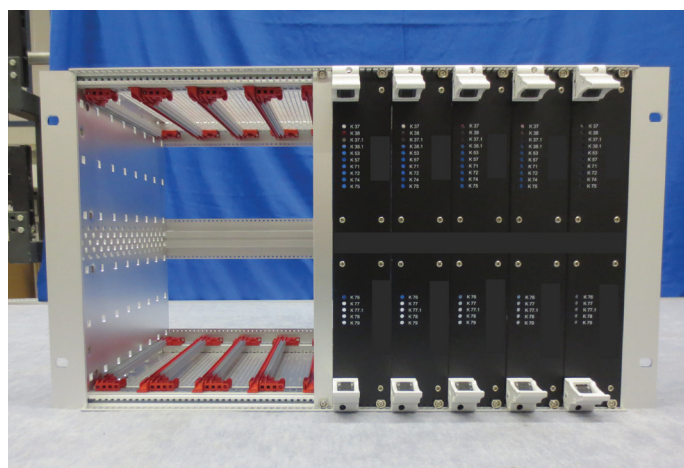
1. RAILWAY APPLICATIONS

1.1 CENTRAL PROCESSING UNIT



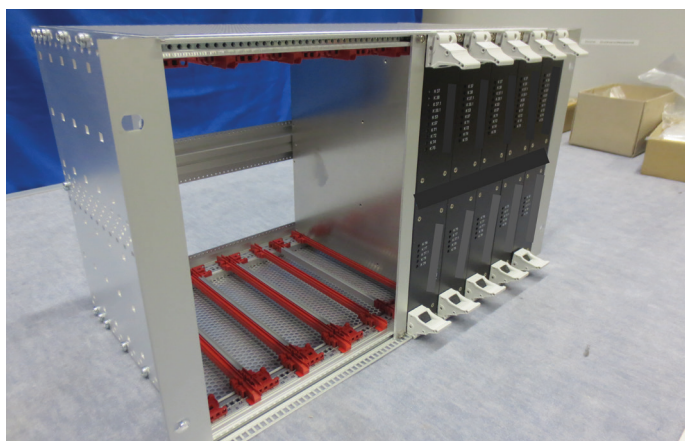
REQUIREMENT

Central Processing Unit for ICE High Speed Train (Doors, Climate, etc.).



CHALLENGE

Subrack's front rail should be suit to UBK handle (de facto standard handle) for plug-in units used in Railway application in Japan.



SOLUTION

Customer requested a mixed application (3U and 6U boards) assembled into one subrack. The support bars on the side panel, the removable threaded inserts, the Center PIN at the rear side and the option to assembly the flowing connectors was also requested. EM protection was a must.

Project Details	
Location	Germany
Type of System	–
Technology	–
Product Scope	130 Trains with 1595 Schroff Subrack EuropacPRO
Date/Time Frame	2014 – 2022
Contract scope	–

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1.2 MAXIMIZING ON-BOARD SPACE WITH EASY ACCESS TO ELECTRONICS



REQUIREMENT

- Access of electronics from the driver's cab
- High mechanical stability
- Maximization of usable on-board space
- Meeting global railway standards



CHALLENGE

- Increasing amount of electronic equipment in vehicle, such as
 - Advanced train control systems
 - Wireless communication systems
 - Embedded computers
 - IoT integrated devices
- Rider-friendly interior design



SOLUTION

The nVent SCHROFF Varistar recently was used to help overcome spatial limitations to integrate the train control unit into the driver's cab. To minimize the footprint of the electronics cabinet while allowing easy access to the panels inside, the Varistar included a swing frame. In a swing frame configuration, the door itself holds electronics and swings opens to allow access to the back panel, which typically contains wiring to inputs/outputs and is necessary for maintenance. Without the swing frame, accessing the back panel electronics in the cabinet would either require the broad (panel) side of the cabinet to sit perpendicular to the cabin wall, obstructing the cab walkway, or removal of the front panel electronics in order to access the back. With the flexible, modular design of the Varistar, configuring a swing frame was a simple modification, and is one of many customizable assembly options.



Project Details

Location	MUs in Europe and US
Type of System	Retro-Fit Cabinet with swing frame
Technology	nVent SCHROFF Varistar
Product Scope	CENELEC EN 50125-3, AREMA 11.5.1, EN 45545-2, EN 61000-5-7, IP 5
Date/Time Frame	Ongoing
Contract scope	Mechanical & Electrical Integration

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1.3 HIGH-PERFORMANCE EMC PROTECTION FOR SIGNALING AND COMMUNICATIONS EQUIPMENT

- Signaling and communications equipment in rail has to perform safely, especially in critical environments
- Ensuring effective coordination of trains, through a reliable and high speed data bandwidth
- Improving real-time data integrity, minimizing delays, ensuring immediate maintenance



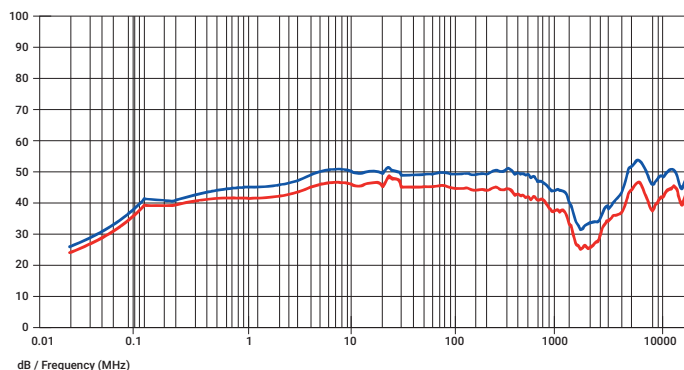
CHALLENGE

- New electronic systems providing more data but also adding more complexity
- Coexisting rail systems are creating an intricate electromagnetic environment
- More passengers and freight, combined with limited infrastructure capacity
- Low operational costs



SOLUTION

The **nVent SCHROFF Varistar EMC** is one of the very few electronic cabinets which has been tested successfully according to EN 61000-5-7 up to **18 GHz** in addition to IEC 61587-3 and offers best-in-class shielding protection: Attenuation of 40 dB at 3 GHz and 30 dB at 10 GHz with a solid door.



Project Details	
Location	Global Scope
Type of System	Signaling and Communications
Technology	nVent SCHROFF Varistar
Product Scope	Electronics Cabinet
Date/Time Frame	Ongoing
Contract scope	Electromechanical delivery and installation

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2. AEROSPACE & DEFENSE APPLICATIONS

2.1 CABINET FOR AEROSPACE & DEFENSE



REQUIREMENT

The customer in this case study is one of the world's largest suppliers of aerospace and defense products, headquartered in North Carolina. They operate in the commercial & business aviation, military & defense, helicopter, space, and network communications industries.

This customer came to nVent SCHROFF needing a secured cabinet for a government customer.



CHALLENGE

Given the need for a secured cabinet for a government customer with unique size, cooling, and other capabilities, nVent SCHROFF was able to offer several solutions to the challenges faced by the customer throughout the duration of the project:

nVent SCHROFF offered an initial array of custom solutions to fit this customer's immediate needs.

Several variations of the eventual base build that have been used on similar programs after the initial configuration was accepted and deployed.

nVent SCHROFF even modified a cabinet during the build process to accommodate a requirement identified by the customer after ordering.



SOLUTION



Not only was nVent SCHROFF able to create that custom configuration within the existing Varistar cabinet, but we were able to accommodate other necessary customizations to the cabinet. The design team provided a series of solutions to the customer's needs and stayed on top of shifting requirements while providing superior lead time and cost comparisons when held up to other suppliers that had been engaged for the same parts.

This allowed nVent SCHROFF to provide the best configuration, cost, and cycle time possible to the customer.

Project Details

Location	North America
Type of System	19" cabinet for government customer use
Technology	Varistar
Product Scope	19" cabinet with steel frame5
Date/Time Frame	2019

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2.2 COMPACTPCI: DATA ACQUISITION SYSTEM



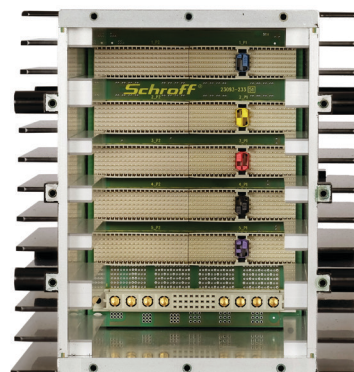
REQUIREMENT

The system needed to be deployed on a civil unmanned aerial vehicle to collect geographical information. As the system is located at the outside of the aircraft, the chassis needed to be completely closed and compliant to IP65.



CHALLENGE

Weight restrictions require a sophisticated mechanical design. Conduction cooling is needed to protect the electronics for shock & vibration and water.



SOLUTION



A conduction cooled chassis was selected. In order to achieve the required processing power the PICMG standard CompactPCI was chosen for the system architecture. A special solution was created to seal the chassis according to IP65, even with the thin side, bottom and top plates. The project was completed in cooperation with the system integrator EMCOMO.

Project Details

Location	Germany
Type of System	Avionics
Application	Data Acquisition System
Technology	CompactPCI
Product Scope	5-Slot CPCI System
Date/Time Frame	2014
Contract scope	1 (Research project)

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2.3 SATELLITE COMMUNICATION FOR VEHICLES IN DISASTER AREAS



REQUIREMENT

The system is used in disaster areas where mobile networks broke down to establish satellite communication. The system will be placed on mobile equipment as trucks, environmental conditions can be unforeseen.



CHALLENGE

In such a grueling environment, the system is exposed to extreme contamination levels and temperature fluctuations and meeting requirements in accordance with IP65 is mandatory. High performance computing inside the system is needed to establish proper communication.



SOLUTION



Rugged MicroTCA, MTCA.3, was chosen as it gives the needed robustness and computing power. The cooling performance was optimized by simulations and measurements. A special power supply board was developed to fit into the dimensions of the box and generate enough power for the application.

Project Details	
Location	United States
Industry	Security and defense
Application	Satellite communication for vehicles in disaster areas
Technology	MicroTCA
Product Scope	Conduction-cooled MTCA system
Date/Time Frame	2011
Contract scope	13 prototypes, project cancelled due to government budget cuts

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2.4 EMC SHIELDING FOR MOBILE RADAR SYSTEM



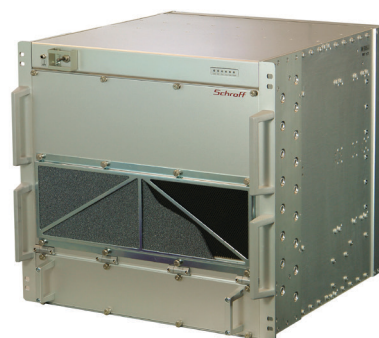
REQUIREMENT

This system has been specifically developed for mobile radar system requirements. It had to be high shock and vibration resistance and meet MIL-STD 710F and MIL-STD 167 standards.



CHALLENGE

To be integrated into the corresponding MIL cabinets, airflow from front-to-back had to be ensured. A very efficient EMC shielding was required.



SOLUTION



The requirement for high shock and vibration resistance is met due to the use of our robust EuropacPro rugged subrack and meets the requirement for MIL-STD 710F and MIL-STD 167. The EMC shielding requirements according to MIL-STD 461 have been realized by a 2 level shielding concept. The chassis itself and a special shielding of the front and rear card cages define the 2 shielding levels. The system can be integrated into the corresponding MIL cabinets due to the optional front-to-back cooling.

Project Details

Location	Turkey
Industry	Security and defense
Application	Mobile radar control system
Technology	VME64x
Product Scope	Rugged System VME64x
Date/Time Frame	2015
Contract scope	10

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3. TEST & MEASUREMENT APPLICATIONS

3.1 CABINET FOR TEST & MEASUREMENT



REQUIREMENT

Vortex Systems LLC is a Enfield, CT based company providing manual or automated Ground Support aircraft component test equipment. They came to nVent SCHROFF in search of a cabinet manufacturer that would be able to be flexible in modifications to cabinets specifically in small quantities.



CHALLENGE

nVent SCHROFF was able to help Vortex Systems' requirements with modifications to as few as one cabinet(s). nVent SCHROFF was able to help with the design phase and be flexible when modification requests of accessories and hardware came up after the initial cabinets were delivered.



SOLUTION



nVent SCHROFF was able to help the customer achieve a standardizing cabinet platform while maintaining flexibility to add as many cabinets as necessary to satisfy Vortex Systems' needs.

nVent SCHROFF also created specialized brackets to help Vortex's need to link cabinets together.

Project Details

Location	North America
Type of System	19" cabinet configurations and accessories
Technology	Cabinets and pane accessories
Product Scope	Varistar cabinets, AC units, Front panels, custom rails.
Date/Time Frame	2019

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3.2 INTERSCALE CASE



REQUIREMENT

The system has been developed to analyze the digital bitstream (I/Q data) on the fiber interface between the BBU and RRH (Remote Radio Head) to measure the effects of Passive Intermodulation (PIM).



CHALLENGE

The cases had to accommodate a customer specific form factor, thus no standard case was available on the market. In addition, the case had to be EMC shielded, which was a challenge because specially developed rubber frames provided by the customer had to be mounted on the case. The rubber frames protect the surface of the case, eliminate mounting feet and provide the frames a firm grip even when the enclosures are stacked. To keep the system compact, passive cooling without mechanical fans was required.



SOLUTION



In order to shorten the development time for a non standard case, nVent takes advantage of its existing Interscale case concept. This allows easy adaptation to the case design, and EMC protection is guaranteed thanks to a special locking mechanism of the side panels. The rubber frame assembly is screwless and easy to remove. For the case with higher heat dissipation, a heat sink with a thermal pad to the processor was used to increase the cooling performance. Both cases are painted according to the customer's requirements.

Project Details

Location	Germany
Industry	Test & Measurement
Application	PIM testing in complex multi band 4G and 5G networks
Technology	Case for Single Board
Product scope / Client	AceAxis through distribution partner 4Most
Date/Time Frame	2019 / 2020
Contract scope	Serial Production

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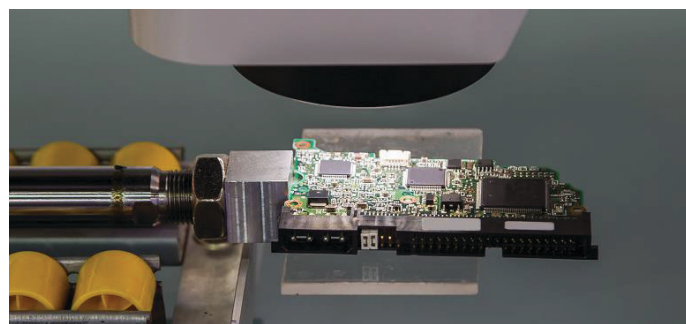
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3.3 MICROTCA



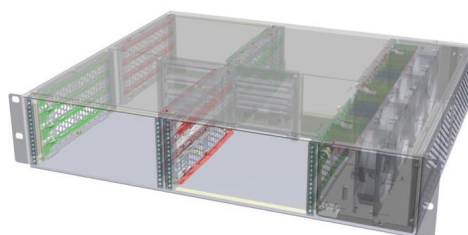
REQUIREMENT

The system is a highly scalable platform for sophisticated machine image and video processing applications for automation, medical, transportation and public safety. The chassis must be modular, flexible, scalable and future proof to allow new or changing hardware to be integrated.

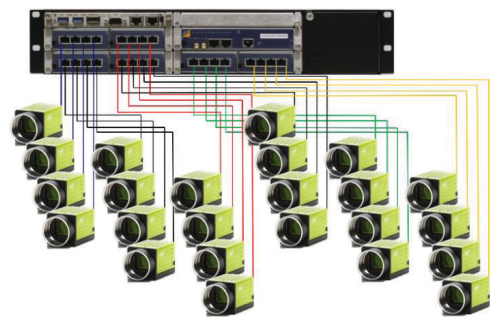


CHALLENGE

The goal was to have six slots in a compact 19 system. This posed a challenge for the mechanical design of the system and the positioning of the backplane slots to ensure the high processing density. The density of the powerful boards required a proper cooling solution that the chassis is adaptable to the application environments in the various vertical markets.



SOLUTION



The vision system is designed according to the MicroTCA 4 standard, as compared to industrial PCs it provides higher bandwidth and allows the connection of more cameras, even in 1 GbE or 10 GbE vision Camera link or Coax Press versions. The number of used cameras depends on the different protocols. With two separate root complexes, the system allows two different tasks to be accomplished in one application. In order to have as much space as possible for the plug-in cards, the system design enables the left and right side panels and their RTM's to be mounted from bottom to bottom. Thus a height of 2 U was possible. The cooling solution is variable and the fan tray is exchangeable. Cooling is possible from side to side or from front to side and can be adapted according to installation and available space in an electronics cabinet.

Project Details

Location	Germany
Type of System	Test & Measurement
Application	Maschine Vision
Technology	MicroTCA
Product Scope	Power Bridge
Date/Time Frame	2017 (Prototyping), 2018 (Serie)
Contract scope	50 pieces / annual

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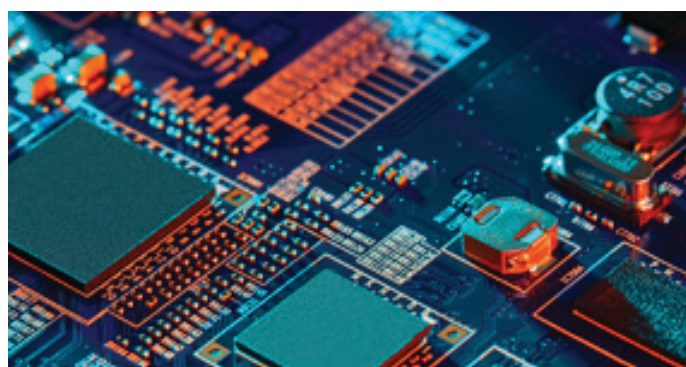
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3.4 PXI EXPRESS SYSTEM



REQUIREMENT

The system is used as a standard system for high voltage signal test and is being deployed in a variety of end applications including automotive, communications, scientific, military/aerospace and consumer electronics.



CHALLENGE

The technical requirements were largely specified by the customer and had to be implemented accordingly. The intention was to give the end user the highest degree of flexibility when configuring his test system with PXI and PXI Express instruments. The system was only allowed to be 2 U high and had to contain 12 slots. It should support PXI Express Gen 3 but also be backwards compatible with the legacy PXI standard.



SOLUTION



In order to have as many free slots as possible for measurement boards, a slim line PXI Express system controller is used in this system. Developed in house, the dimensions are 3 U and 4 HP and has a COM Type 6 module integrated. To ensure backwards compatibility, most slots are hybrid slots. The chassis is delivered completely integrated with the chassis management, passive backplane and mechanics. Since the individual components are part of our portfolio, the system could be produced without significant development effort.

Project Details	
Location	Germany
Industry	Test & Measurement
Application	Standard Test System
Technology	PXI Express
Product Scope	VX Instruments GmbH
Date/Time Frame	2019 / 2020
Contract scope	Validation completed

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3.5 NETWORK TEST SYSTEM



REQUIREMENT

The system was developed for testing and verifying high-speed network elements and is used as a standalone system. It should be portable and must have a large display assembled.



CHALLENGE

The system requires a touchscreen as an input and output unit. It must be lightweight with top handle for service technicians and the customer wanted to have a unique system design.



SOLUTION



The system is built and the controller board integrated by nVent. The backplane with CompactPCI connectors enables versatile system configurations. The exchangeable fan unit ensures adequate cooling and serviceability. The enclosure from the RatiopacPRO family offers many design options. Through simple modifications, nVent developed a one-of-a-kind customer solution from standard components.

Project Details

Location	Germany
Type of System	Test & Measurement
Application	Network test system
Technology	Proprietary system based on IEEE standard
Product Scope	Proprietary system based on 6U boards
Date/Time Frame	Prototype 2013, series started in 2014
Contract scope	Annual quantity 150 pcs

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4. DATA NETWORKING SYSTEMS & TELECOMMUNICATIONS APPLICATIONS

4.1 ADVANCEDTCA COMMUNICATION SYSTEM



REQUIREMENT

Applications in telecommunications require systems that guarantee high availability and a high data rate. New NEBS requirements and limited space for air at the side of the cabinets demand a front to rear air flow in the system even if the boards are mounted horizontally.



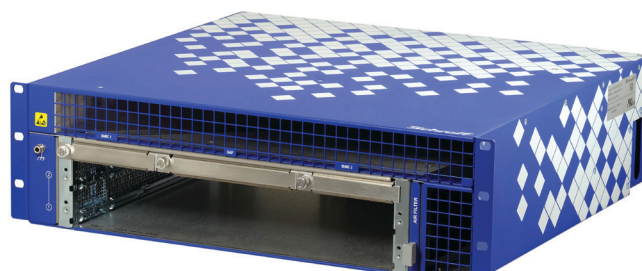
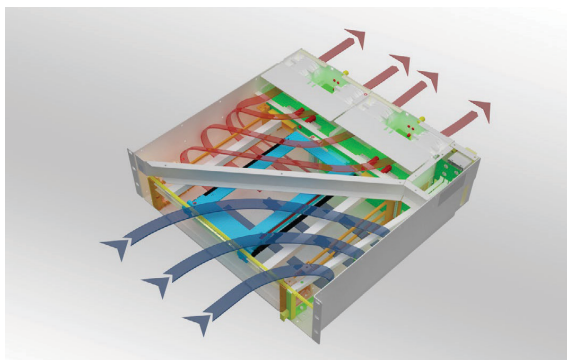
CHALLENGE

To cool 450 W/slot of power dissipation with front to back air flow and very high system air impedance.



SOLUTION

nVent integrates front-to-back cooling to use cold air in the front area of cabinets, thus achieving effective ventilation. The use of special fans that provide very high air pressure and a sophisticated airflow in the chassis make this possible.



Project Details

Location	United States
Industry	Telecom / IP Communication
Application	Router / Switch
Technology	AdvancedTCA
Product Scope	2 Slot ATCA 450/40
Date/Time Frame	Project start 2015, expected project run time 5 years
Contract scope	Annual quantity 120 pcs

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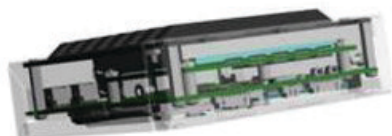
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4.2 INTERSCALE C APPLICATION



REQUIREMENT

Based on Interscale C for e-NUC. Customer requirement: Integrate the heat pipe into the case design to save room, parts and to lower price.



CHALLENGE

Integrate the heat pipe into the top cover. Move the PCB and the cased design by 180°. Add an opportunity to assemble the box on a Din-Rail.



SOLUTION

Cooling fins and heat pipe in one part. Heat dissipation >12 W. Reduction of assembly time up to 5 min.

Project Details	
Location	Germany
Type of System	Embedded NUC form factor based IOT solution
Technology	E-NUC Board
Product Scope	Series
Date/Time Frame	05 / 2016
Contract scope	> 500 boxes per year

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4.3 TELECONFERENCING SYSTEM



REQUIREMENT

The customer needed a flexible solution for an audio conferencing system which gives the end user the chance to extend the possible number of simultaneous conference calls in the future. The application started with 500 to 1000 ports for Audio conferencing and can be upgraded up to 20.000 ports.



CHALLENGE

To build a chassis with a modular card cage in the back, a nice looking LCD touch panel in the front and front-to-back air flow. Integrating the LCD display electrically into the MicroTCA environment.



SOLUTION



This system was designed in cooperation with partner companies NAT and Lindenbaum. Due to the scalability MTCA.0 standard was chosen. The system was turned around and the 19" brackets were moved to the rear side with the AMC modules plugged in the rear. Adding the functionality of an Ethernet switch acting as an AMC to the backplane and connect to the LCD.

Project Details

Location	Germany
Industry	Telecom
Application	Teleconferencing System
Technology	MicroTCA for single full-size module
Product Scope	10-Slot MTCA.0 System with integrated TFT
Date/Time Frame	Prototype 2015, Series expected in 2017
Contract scope	25

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