

White Paper

Working Principles of the Electronic Room Acoustic Systems VIVACE and VICELLO

Munich, October 2017

General

The VIVACE processor is designed to supplement the acoustic requirements of large and highly demanding concert halls, opera houses and performance spaces.

The VICELLO processor is based on the same architecture and processing algorithms as the VIVACE processor. It is restricted to be used in smaller rooms like school halls, larger conference rooms, auditoriums and smaller town halls. Therefore the number of channels is limited and the system costs can be reduced to a substantially lower price without compromising the acoustic results.

Working principle

The VIVACE and VICELLO processors are based on a hybrid principle that combines active signal processing and convolution technology with a multi-microphone regenerative signal processing. This approach ensures that the room's native acoustical characteristic is obtained and no acoustical separation between the stage area and the audience area occurs. The additional energy required for the acoustical enhancement to be generated by the VIVACE and VICELLO processors is originated by all microphones evenly, primary stage microphones and evenly distributed room microphones. All microphones are weighted equally but time aligned properly.

Playing out individual portions of the added room, these signals are picked up by the nearby microphones again and fed back into the processing chain. This reconvergence process ensures that all areas of the room are fully and equally included into signal generation and signal distribution.

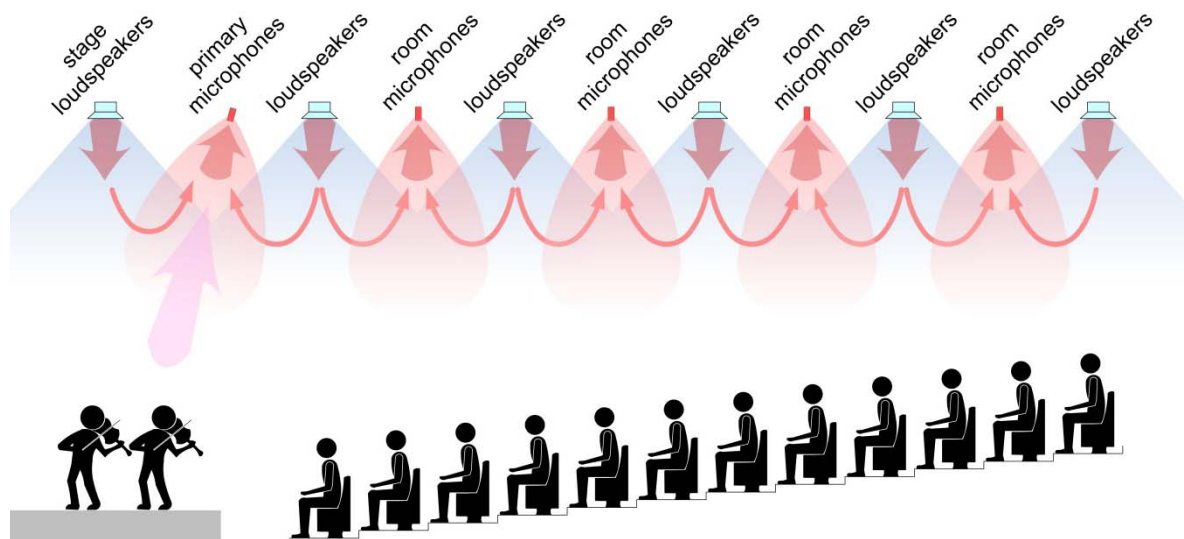


Image: Main hybrid sound paths with stage sound pick up and room sound regeneration.

Processing

The entire signal processing including the convolution algorithm is performed in the format 48 kHz / 24 bit. Signals are fed in and out of the processing unit via MADI (VIVACE) or ADAT (VICELLO).

The internal signal matrix incorporates up to 192 input and 192 output channels working as a crosspoint matrix with level, delay, compressor, unlimited scalable parametric EQ control on the inputs and outputs and level and delay control on all crosspoints.

This complex signal path structure fulfills all electronic architecture requirements within the signal routing.

The signal processing architecture consists of two parallel processing groups:

- Convolution Processing Acoustic Module with four two-channel engines which are processing signal groups from any desired microphone channels, each of them featuring four complex room acoustic outputs
- Convolution Processing Reconvergence Module with up to 32 convolution processing layers and up to 16 early reflection convolution processing layers

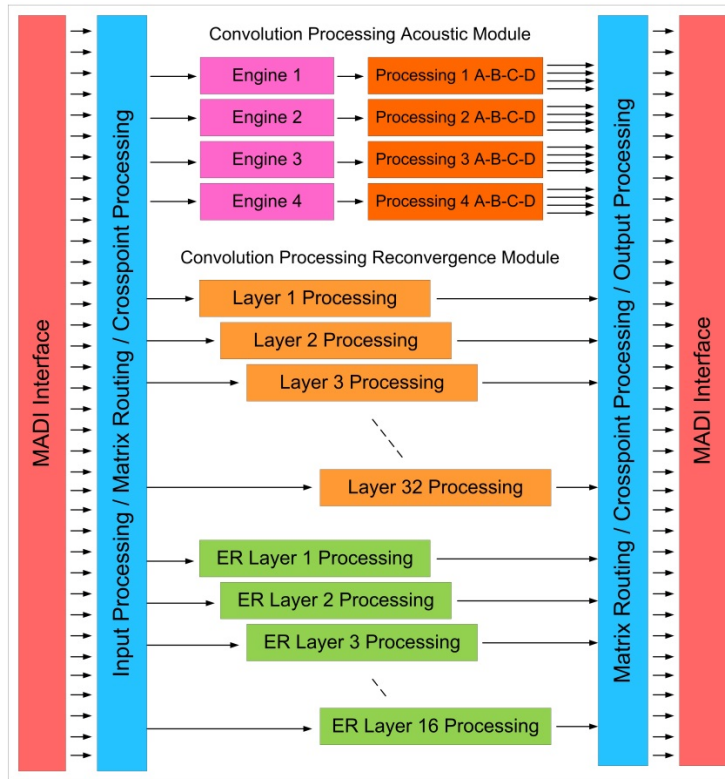


Image: Processing layers VIVACE.

All processing layers use the patented VIVACE convolution algorithm. Convolution impulse responses can be freely chosen and been based either on real rooms or are to be generated as sound neutral impulse responses. The neutral responses are used to enhance the room's own acoustical characteristic without introducing artificial or inappropriate sonic and sound properties.

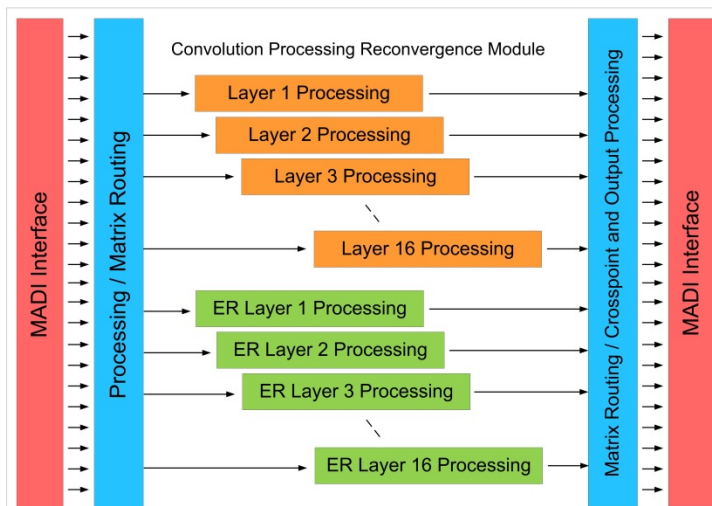


Image: Processing layers VICELLO.

The VICELLO processor is designed with fewer processing channels and without the Convolution Processing Acoustic Module, because of its potential target users, to be installed in smaller rooms with less microphones and less loudspeakers.

The multilayer structure even allows the usage of the VIVACE processor for two separate rooms with individual musical use by assigning distinct processing capacities to each room. This can also be used to build up the regular room acoustic system for the hall and an additional stage system as artificial orchestra shell.

All output channels can be combined within the matrix with additional independent input signals, like surround sound signals, sound reinforcement back channels, etc.

Hardware

As the basic platform professional servers, as used in cloud storage and data centers around the world, were chosen due to their high reliability and easy maintenance and warranty handling through professional server suppliers in the respective continent or state.

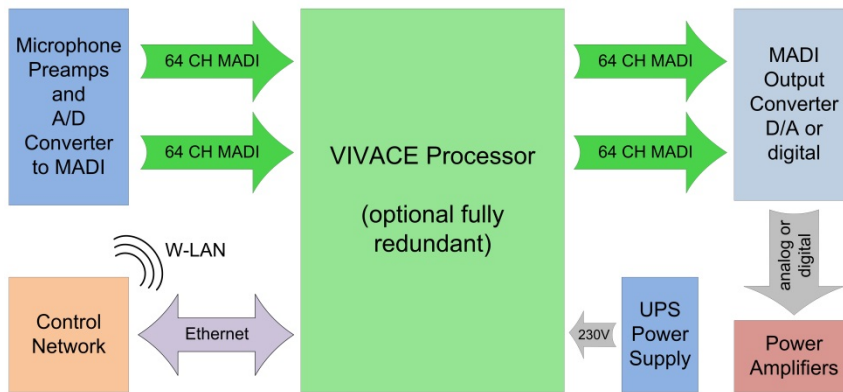


Image: VIVACE installation infrastructure.

The VIVACE server has the following dimensions (W x H x D): 19” rackmounted x 2 RU x 75 cm. Sufficient air conditioning must be taken care of. Due to optical fiber wiring for MADI and Ethernet control the server can be installed remotely up to 100 m and more.

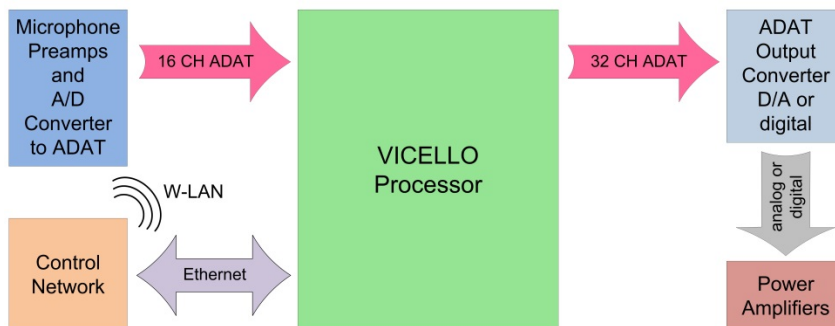


Image: VICELLO installation infrastructure.

The VICELLO server has the dimensions of a regular Midi-Tower. For the Midi-Tower also sufficient air conditioning must be taken care of. The server can be remotely positioned in accordance to the maximum length of the optical fibre for ADAT signal transmission.

Microphones

High-quality condenser microphones with cardioid characteristic are used for VIVACE and VICELLO installations. The room microphones are installed about 50 cm below ceiling level and the primary stage microphones are installed in a proper position concerning stage coverage, sound travel path delay and stage scenery.

Loudspeakers

Loudspeakers with sufficient power rating are to be used to ensure proper energy supply into the room for early reverberation and early reflections. As main ceiling systems high power coaxial cabinets with adequate bass response should be used.

For side wall lateral early energy column speakers should be used if possible and under balcony positions must be covered with a sufficient number of smaller low power speakers.

Network

The system is fully Ethernet network based. All control commands and all software maintenance is executed via network and via remote access only.

For user control a platform independent browser app is accessed via network from the server by any network-capable user interface like smartphone, tablet or notebook PC. All presets for the different acoustical settings are displayed via the Internet browser and ready for execution automatically after connecting to the network with appropriate password access.

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