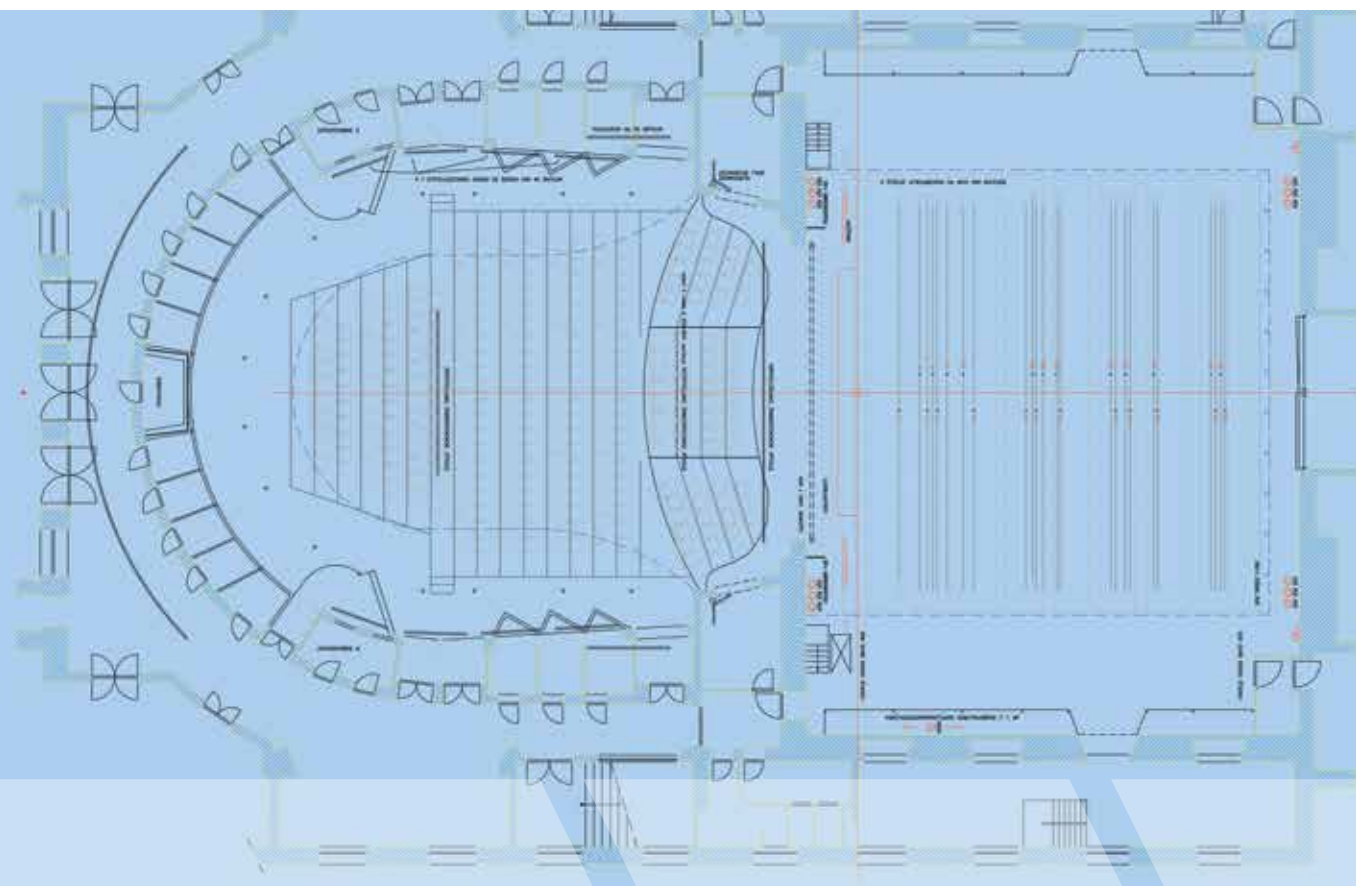# Integration and interoperability.

| Performance requirements | The d&b ArrayCalc simulation software **Planning and simulation** External simulation software | The d&b Remote control solutions **Operation** Third-party integration | The d&b amplifiers **Processing and distribution** The d&b Network audio solutions | The d&b loudspeakers **Reproduction** |

Welcome to System reality.

d&b audiotechnik

Contents.

Integration and interoperability.

The dependable solution
A complete d&b solution enables integrators to deliver reliable, predictable system performance. d&b software simulates the entire system precisely and provides comprehensive remote control. Whether for large or small applications, the d&b system approach ensures reliable results can be achieved every time, straight out of the box.

Sonic excellence
d&b provides the tools needed to ensure that every listener hears every detail, everywhere. As a result, d&b loudspeaker systems are trusted by system designers, engineers, and integrators worldwide, making them distinctly rider-friendly. Each element is tightly specified, precisely aligned, and carefully integrated for maximum efficiency and optimum performance.

The integration choice
d&b installation systems are made specifically for permanent integration – the loudspeakers fit unobtrusively into any application and perform in acoustically challenging environments. The amplifiers offer powerful DSP options, network system integration, and various other installation-specific functionalities.

d&b Workflow for installation applications
At the very beginning of every installation project, the performance requirements are considered. Architects, consultants, designers, integrators, along with product manufacturers must work together to create unique experiences for their clients. It is important to understand and support each contributor's needs with a comprehensive plan that is based on information gathered at every stage of the process.

Interoperability
Designing d&b technology in the heart of an installation project increasingly requires interoperability with thirdparty system manufacturers.

A media control system or processing platform can centralize and manage multiple inputs. Control systems typically consist of: a control processing unit and user interfaces, such as touch panels, tablets and switches. In case of an emergency seamless integration of the performance system in a voice alarm system is a critical requirement for many public spaces.

With a growing range of media control plug-ins, connectivity and enabling technologies, d&b sound reinforcement systems can be designed for intuitive and easy everyday handling for all users and for performances of any kind.

Network-driven d&b devices enable the straightforward integration of such a system into an Ethernet-based audio network and provide additional signal management for the most demanding applications. Parameters of the signal management system can be controlled remotely via an open network protocol (AES70/OCA), ensuring the reliable synchronization of these extended functions with the control system.

This makes a d&b system the ideal solution for any installation demanding the highest audio performance and fully customizable remote control capabilities.

The d&b Workflow - from planning to operation.

| Performance requirements | The d&b ArrayCalc simulation software **Planning and simulation** External simulation software | The d&b Remote control solutions **Operation** Third-party integration | The d&b amplifiers **Processing and distribution** The d&b Network audio solutions | The d&b loudspeakers **Reproduction** |

The d&b System reality.

As the name implies, a d&b audiotechnik system is not just a loudspeaker. Nor is it merely the sum of its components: loudspeakers, amplifiers, accessories and software. Right from the outset the d&b audiotechnik approach was to build integrated sound reinforcement systems that actually are more than the combination of its parts: an entirety where each fits all. Every element is tightly specified, precisely aligned and carefully integrated to achieve maximum efficiency of both power and time. For ease of use, all user-definable parameters are integrated in the amplifiers, allowing the possibility of adjustment, either via remote control surfaces or directly on the amplifiers. Neutral sound characteristics leave the user all the freedom needed, whatever the brief.

For installations, both seamless integration and interoperability with external devices are available for general operation or for use as integral parts of an evacuation system.

Network Media Convergence

I/O

Amplifier

Loudspeaker

Digital Signal Processing

Network Media Convergence

d&b control

**Integration in media control
General processing platform**

**Integration
in voice evacuation**
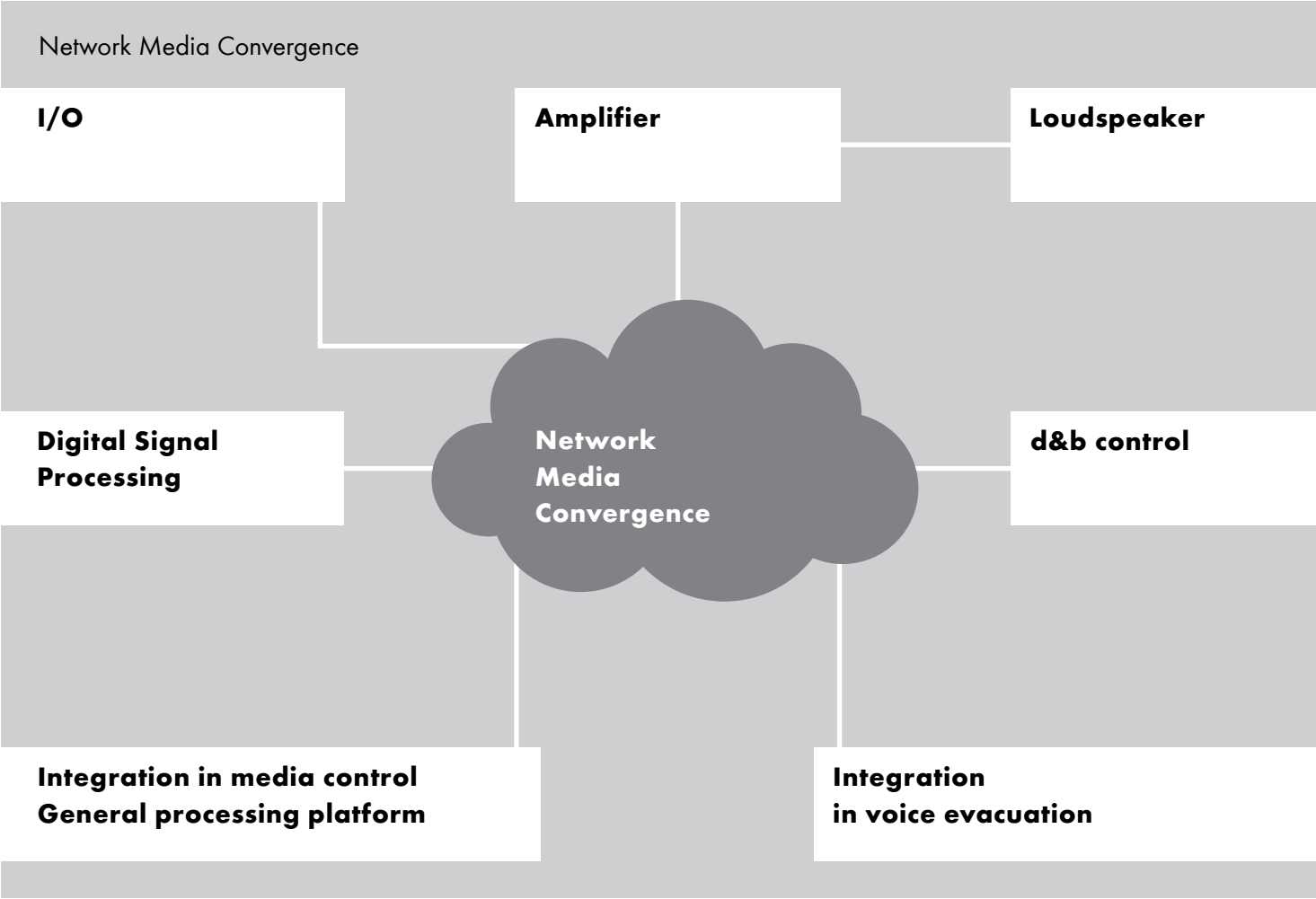
At the same time, d&b offers integrated finance, service and support, a knowledgeable distribution network, education and trainings, as well as technical information to make sure that the same optimized acoustic result is achieved consistently by every system, anywhere, at any time. In real terms, this means the d&b System reality.

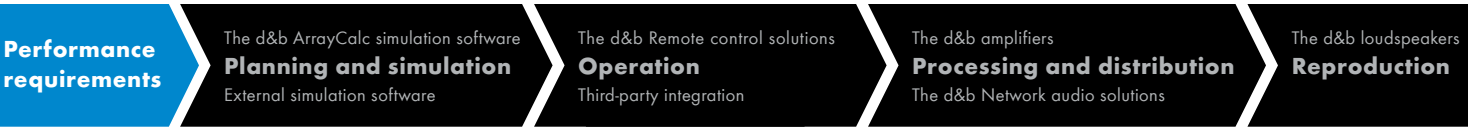# Performance requirements, design and planning.

Venue data
The integrated d&b Workflow improves efficiency from the start of a project through planning and simulation to control of the final result.

Measurements are used to create a 3D model of the venue in the d&b ArrayCalc simulation software. To assist with a tendering process, ArrayCalc can produce the precise documentation required to support all the potential solution providers. Venue data with CAD files including room measurements can be provided by EASE, Revit, Auto CAD or similar.

Graphic example of an EASE model without mapping
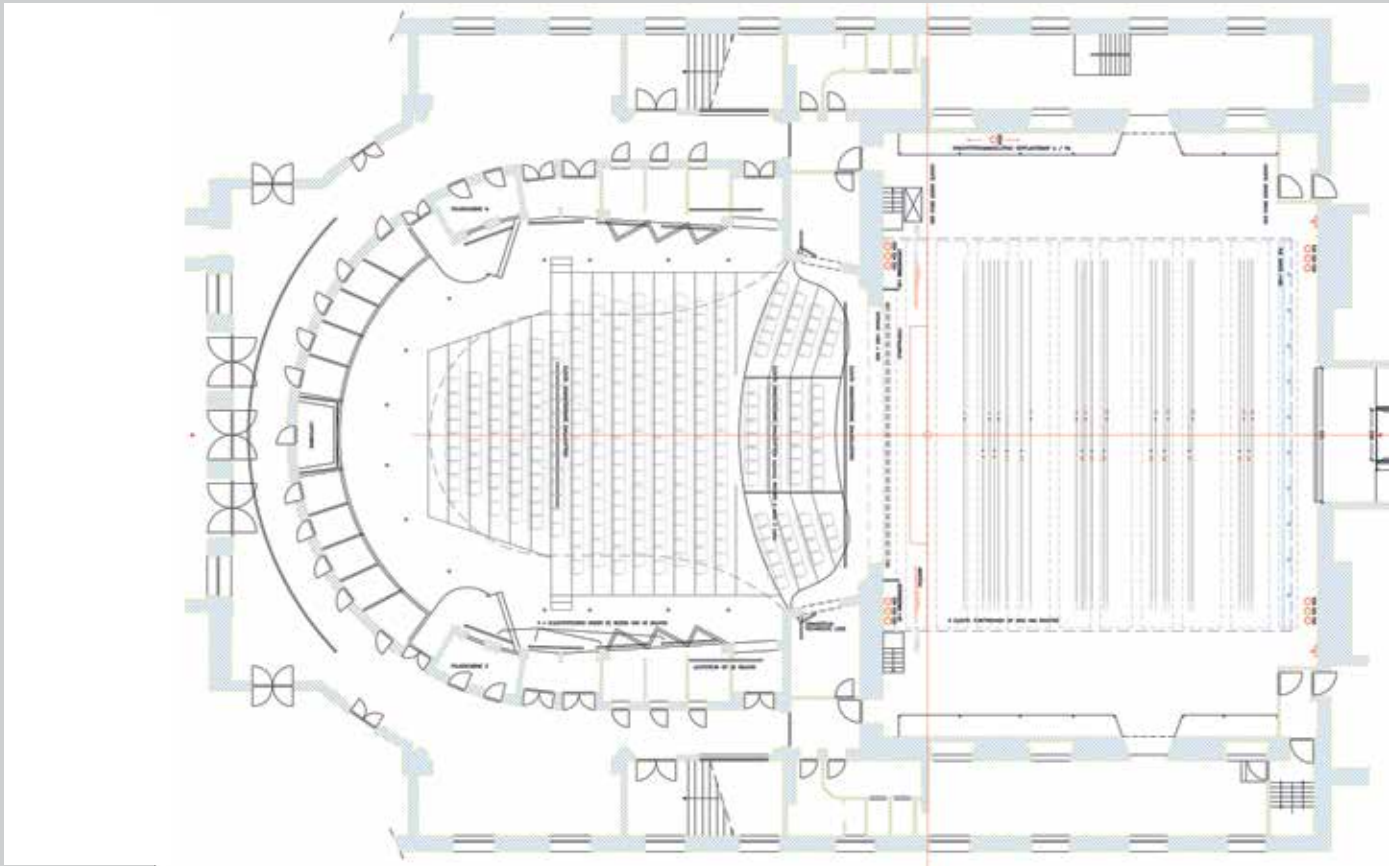
Additionally, the performance specification manual defines the performance requirements (ideally, part of the unmapped EASE model for the tender specification, including the requirements for Speech Transmission Index (STI) level distribution to every seat by frequency, etc.)

| **Performance requirements** | The d&b ArrayCalc simulation software **Planning and simulation** External simulation software | The d&b Remote control solutions **Operation** Third-party integration | The d&b amplifiers **Processing and distribution** The d&b Network audio solutions | The d&b loudspeakers **Reproduction** |

Performance requirements, design and planning.

Installation design and planning with d&b Revit files
What is Building Information Modelling (BIM)?
BIM is a process by which a digital representation of the physical and functional characteristics of a room, facility or place is created and managed. Using a BIM tool such as Revit, a virtual 3D model integrates the design and construction processes and makes them interoperable. Further dimensions can be included to track quantities, costs and how a project will evolve over time.

Virtual models also provide a shared knowledge resource for information that can be used by everyone involved in a project, and are used to support decision-making regarding building assets, including loudspeaker placement and configuration.

BIM is increasingly becoming an essential part of construction projects, with many countries making the adoption of BIM practices mandatory.

The main advantage of BIM is the holistic, streamlined exchange, integration and management of project information through a multidimensional model, centrally shared between multiple project contributors.

What is Revit?
Revit is a robust project information and collaboration tool used by the majority of architects, engineers, designers and contractors as part of the BIM process. Revit can model building components in 3D, annotate the model with 2D drafting elements, and generate building documentation from Revit models.

Each component of a model includes a detail-rich database of applicable information such as dimensions, part lists and power consumption. Once rendered, the model provides a realistic image of the completed project.

d&b Revit families
All d&b loudspeaker systems and their accessories can now be seamlessly loaded into Revit using d&b audiotechnik Revit families. This allows consultants, architects and system integrators to include d&b loudspeakers in a Revit based BIM process at any stage of a project.
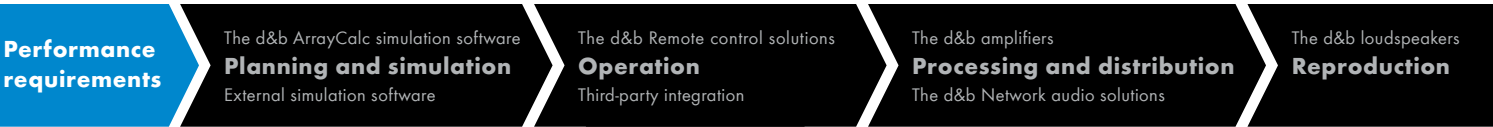

All files come complete with an information rich database that includes:
▪ Detailed 3D data for photorealistic renderings, including texture
▪ Visualisation of Special colour versions of d&b loudspeakers
▪ Non-branded renderings to support a neutral tender process
▪ Complete accessory package for holistic planning and determining quantities
▪ Parts list, including d&b parts numbers simplifying the order process
▪ Complete list of technical specifications for each product
▪ Line array workflow similar to ArrayCalc, up to 24 boxes
▪ Panning and tilting functions for accuracy
▪ Threaded inserts to align accessories exactly

Advantages
Using the BIM process in construction and installation projects improves efficiency and reduces costs by eliminating conflicts in the planning process. As a BIM tool, Revit supports a collaborative design process across multiple disciplines. The BIM workflow with soundsystems is simplified with d&b Revit files through a complete database of highly detailed technical and planning information. Using d&b Revit files, all project participants can expect a remarkably accurate visual representation of a d&b system within a model, and a simplified workflow from planning to ordering. In short, d&b Revit files provide an easier, richer planning experience. d&b Revit files are available to download from www.dbaudio.com

Performance requirements

The d&b ArrayCalc simulation software
Planning and simulation
External simulation software

The d&b Remote control solutions
Operation
Third-party integration

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Processing and distribution
The d&b Network audio solutions

The d&b loudspeakers
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Performance requirements, design and planning.

**d&b ArrayCalc simulation and system design software**
Using system performance requirements as a starting point, system design begins with a process of loudspeaker selection, positioning, prediction, and optimization until system performance requirements are surpassed. With ArrayCalc line arrays, point sources and sub arrays can be designed for optimum acoustic performance with even frequency response and level distribution across the entire listening areas.
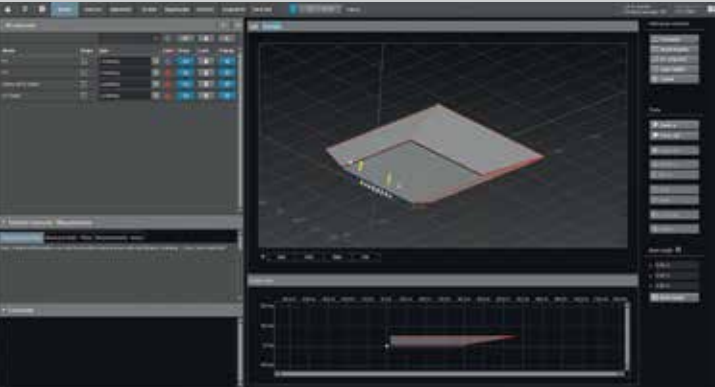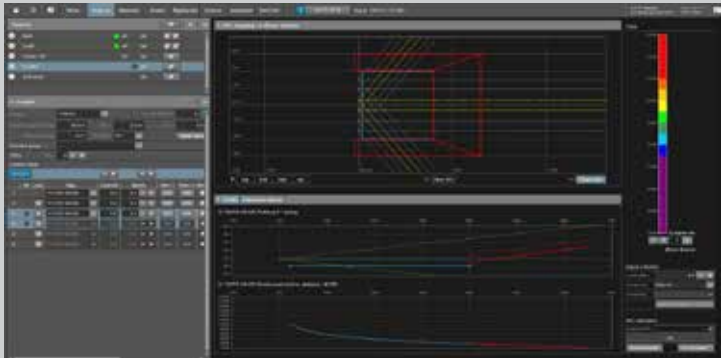

ArrayCalc
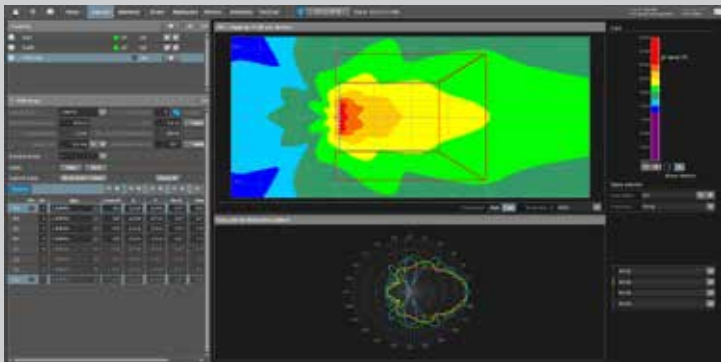Venue view
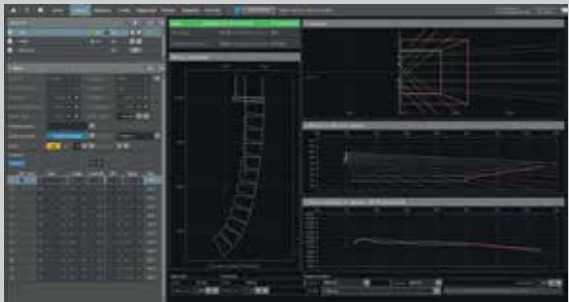
ArrayCalc
Sources view
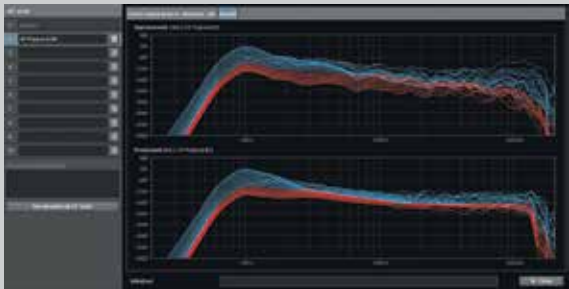
ArrayProcessing
calculation result

ArrayCalc
Point Source view

ArrayCalc
SubArray calculation

ArrayCalc
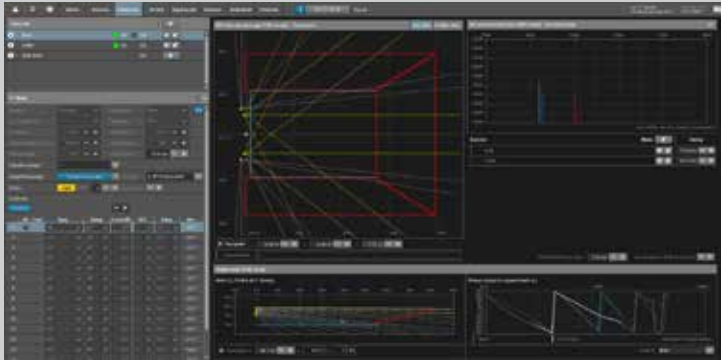System Timealignment
calculation

Once the mechanical array settings have been finalized, the system can be further improved using the ArrayProcessing function within ArrayCalc. This applies powerful filter algorithms to optimize the level and tonal balance of a line array over the entire audience area.

Performance requirements	The d&b ArrayCalc simulation software **Planning and simulation** External simulation software	The d&b Remote control solutions **Operation** Third-party integration	The d&b amplifiers **Processing and distribution** The d&b Network audio solutions	The d&b loudspeakers **Reproduction**

Performance requirements, design and planning.

Direct SPL simulation with ArrayCalc
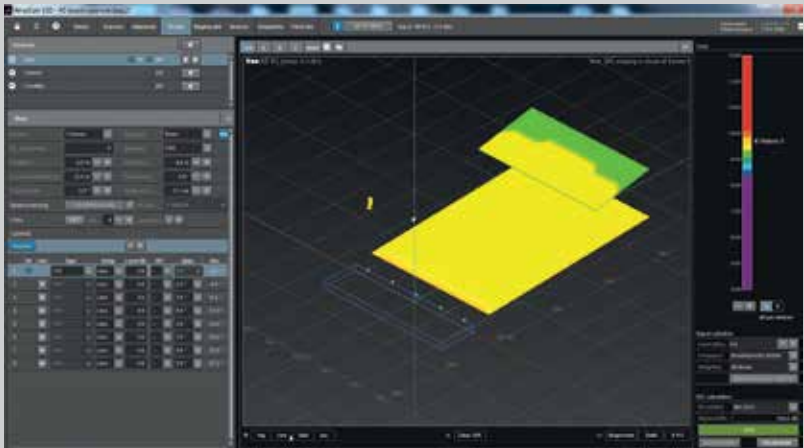For the whole system design or only individual positions, the result can be checked fast and precisely within ArrayCalc using Direct SPL simulation. So the design can quickly optimized to meets the requirements.

Detailed system configuration with 3D plot and SPL mapping

ArrayCalc export for further planning and verification purposes
ArrayCalc has a number of export options.The planner can use the PDF export functions to create visuals for presentations and documentation. Furthermore, the loudspeaker design can also be exported as a 3D model and thus easily imported and displayed in CAD plans or room models. And The coordination and configuration of each source group can be exported to the acoustics modeling software package EASE for further acoustic simulations.
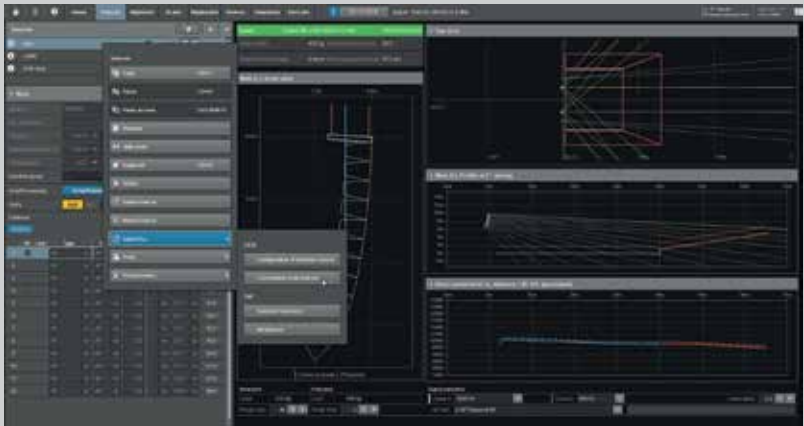

The ArrayCalc export contains the coordinates of the sources and secondly the configuration of the speaker (Speaker setup and user defined settings CUT, HFC, Coupling, Delay etc.).

Verification with external acoustic simulation – EASE modeling
EASE can import the ArrayCalc loudspeaker design model to calculate STI (Speech Transmission Index) or to simulate acoustics for additional verification within detailed room information. Source coordinates and configuration can be imported directly from ArrayCalc and applied to an EASE model.

Architectural view
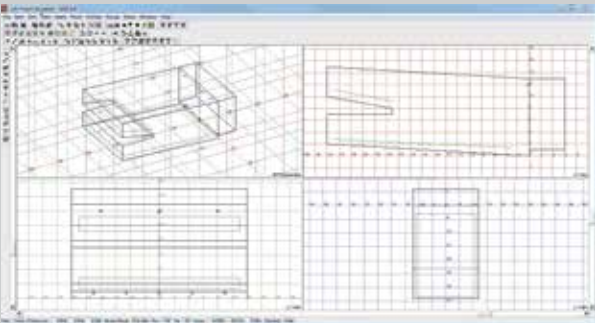
Import of coordinates and configuration

EASE speakers database for all d&b loudspeakers
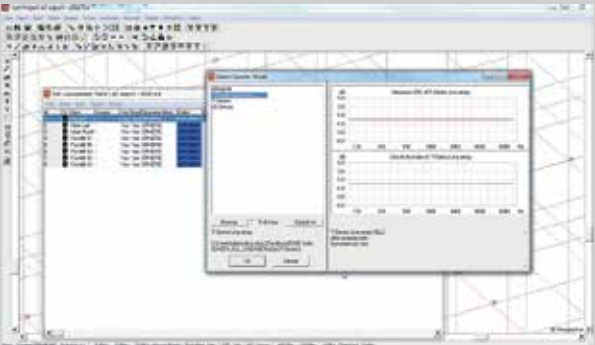
GLL configuration import from ArrayCalc file
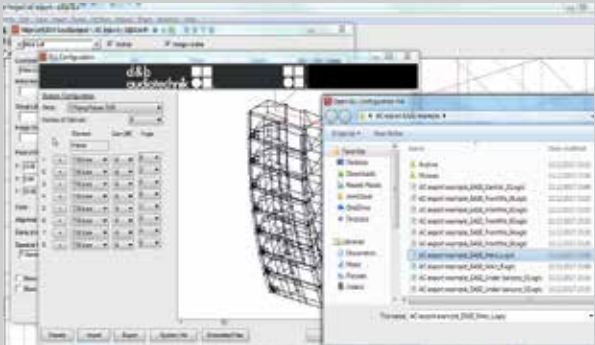
EASE speakers import
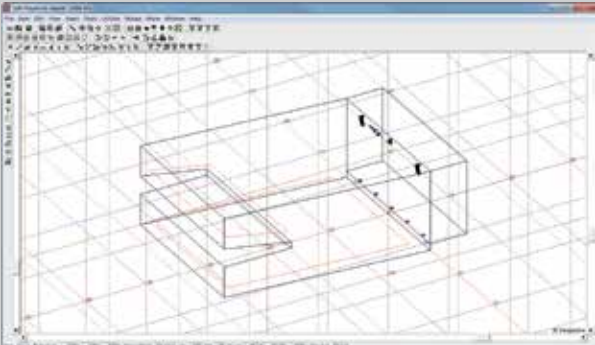
EASE modeling with STI

Performance requirements

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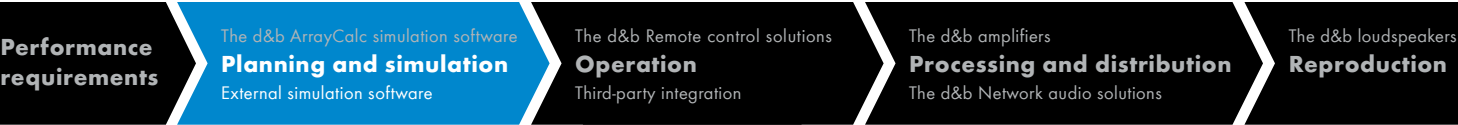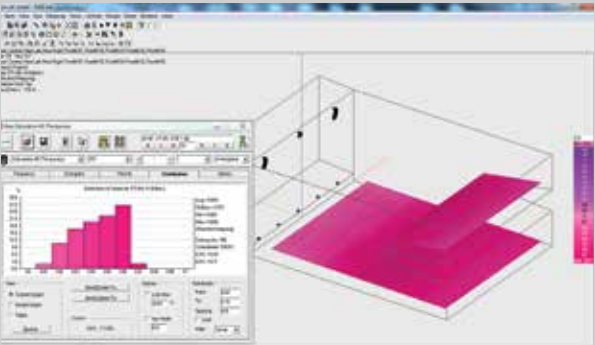
Performance requirements, design and planning.

Amplifier configuration and network signalflow

ArrayCalc allows the planner to design a complete system. Within ArrayCalc the amplifier type can be defined for each individual loudspeaker and all configuration parameters of this amplifiers can be set.
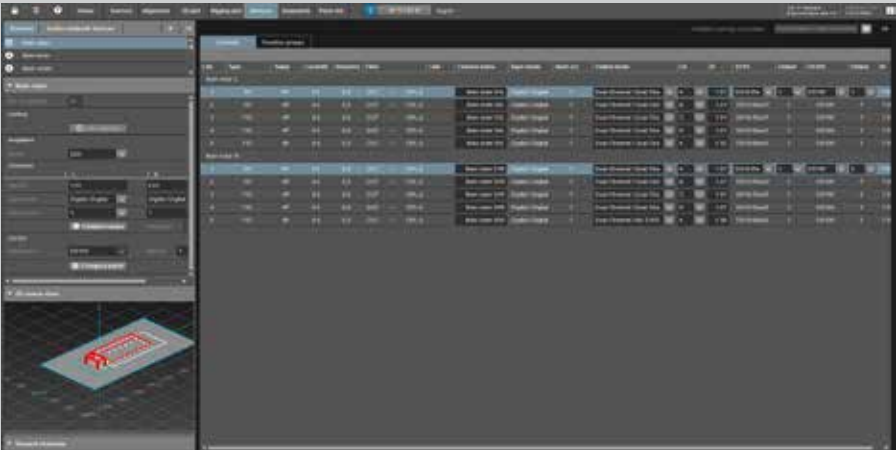
Amp configuration

One or multiple DS10 can be defined for controlling the amps from the DANTE network including output assignment. DS100 signal engine can be integrated for more sophisticated signal distribution into the system and signalflow.
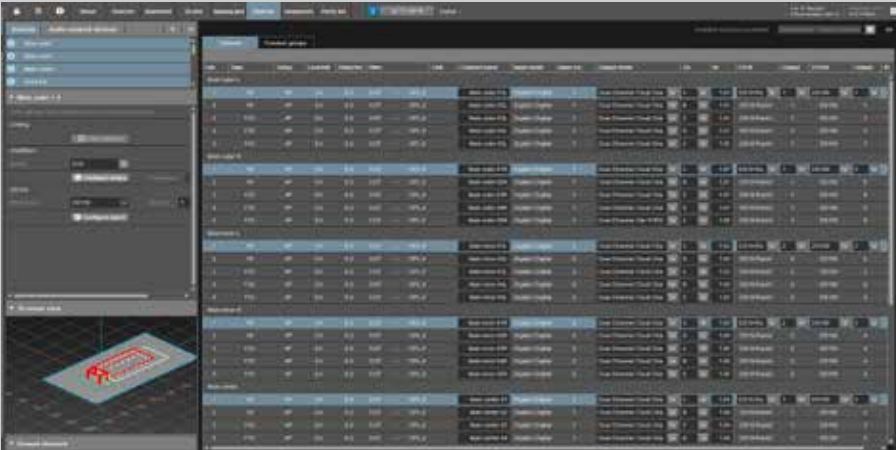
Dante signalflow
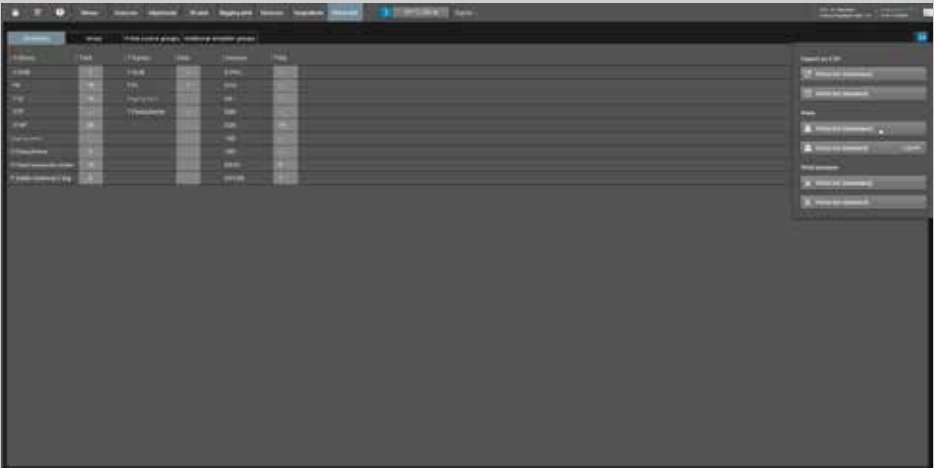
Part List

Equipment lists and paperwork

Various export functions into different formats are available to simplify the provision and integration of the complete equipment lists into the planning documents during all planning phases.

Operation.

The d&b R1 Remote control software
The d&b Remote network allows central control and monitoring of a complete d&b loudspeaker system, be it from a computer in the control room, at front of house, or on a wireless tablet in the auditorium. All functions of a d&b system are accessible. Access can also be restricted, depending on a user's role and requirements. With grouped controls, detailed system and device diagnostics plus firmware updates, the d&b Remote network unlocks the full potential of the d&b system approach.

R1 V3 Project file
Home view

Using the same project file as ArrayCalc, the d&b R1 Remote control software generates an intuitive graphical user interface for the system. All of the settings that were carefully defined in ArrayCalc can be sent to the amplifiers. The automatically generated graphical user interface can be customized to meet user requirements. Changes to the project file can be performed at any time in both ArrayCalc and R1. This workflow eliminates the need to manually transfer data between the software programs.


Main view in
Configuration mode

System overview in
Configuration mode

DS100 operation
In addition to the amplifier control, R1 also controls the functions of the DS100 including 64 x 64 matrix settings, operation of the Soundscape functions for the object-based positioning of En-Scene and adjustments o the parameters for the room emulation En-Space.
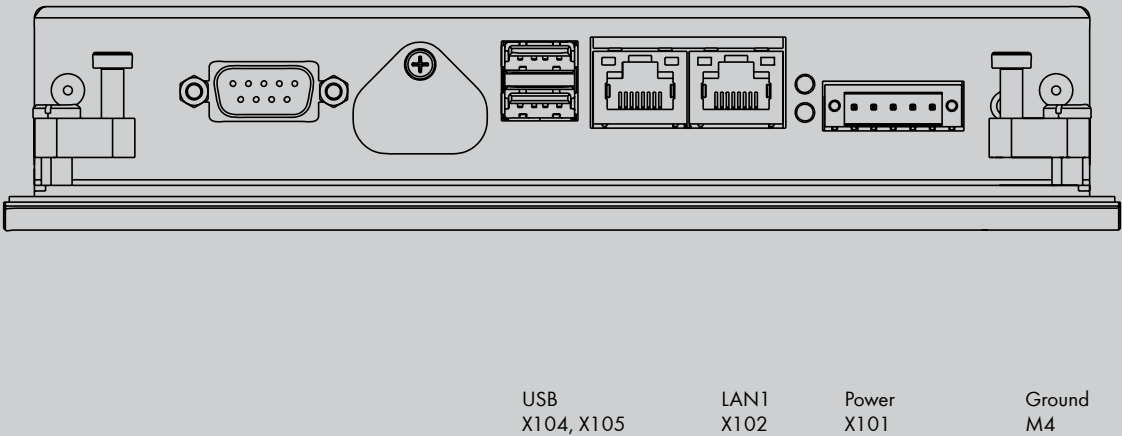

DS100 matrix screen
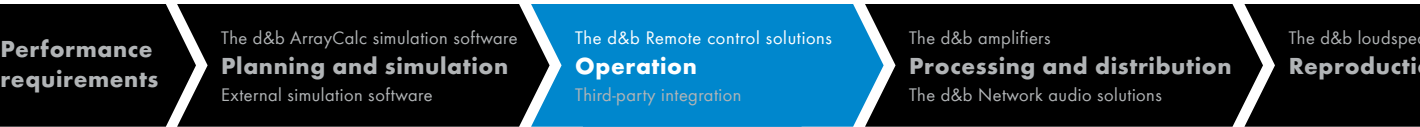
Operation.

R90 Touchscreen remote control
The R90 Touchscreen remote control is a 7" panel PC used for quick and reliable operation of day-to-day functions of a pre-configured d&b system, without needing expert level knowledge of audio. The introduction of the R90 further expands the d&b system approach, increasing efficiency and unlocking additional flexibility of d&b loudspeaker systems.
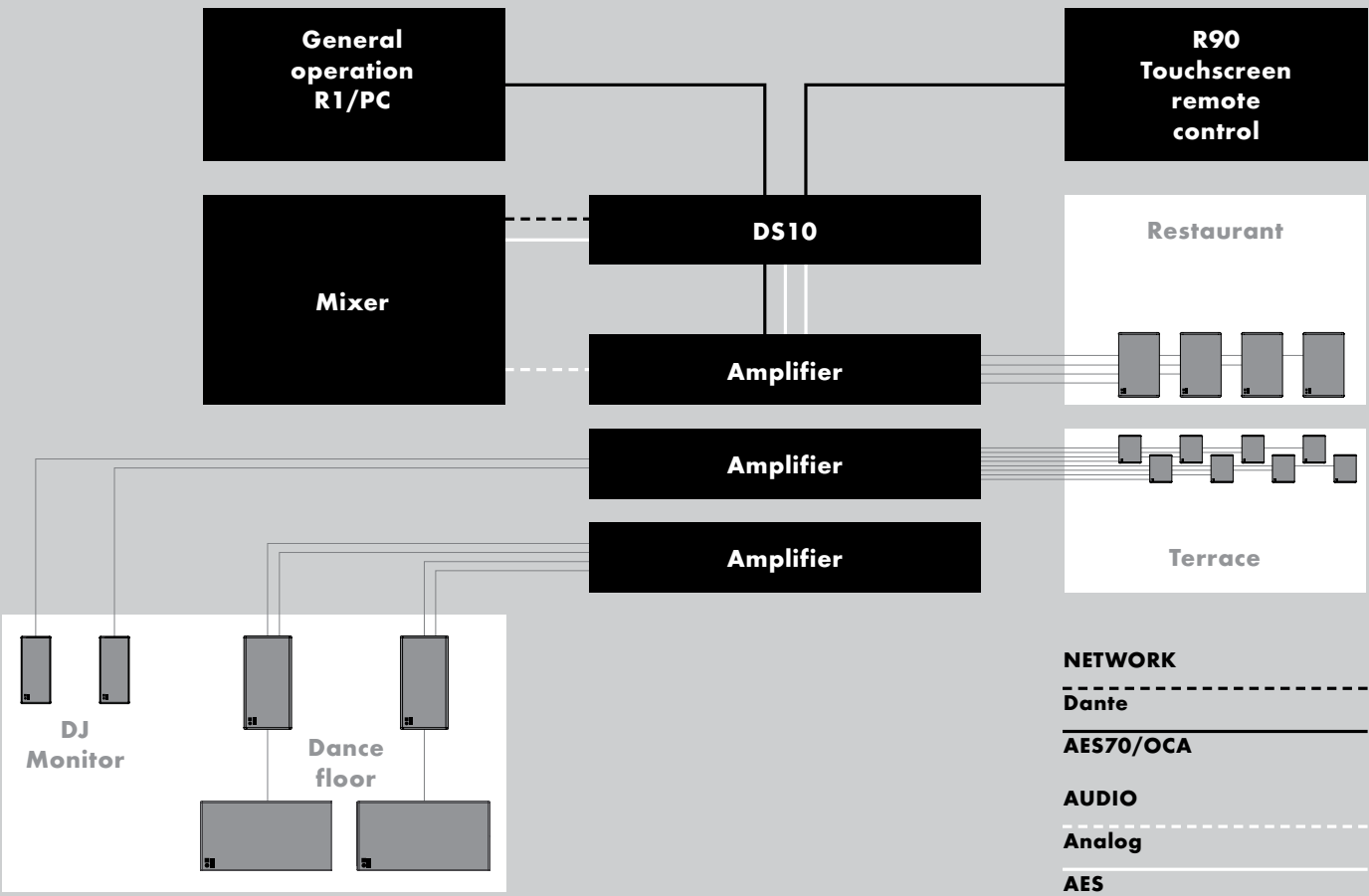
An intuitive graphical user interface provides one-touch control over power, mute, level, grouping and recall of up to nine AmpPresets. R90 functions entirely independently of R1 and eliminates any risk of accidental changes at the system level. Setup and configuration of R90 project settings can be accomplished quickly and easily, after which everyday activities can be managed without a technician present.

R90 can also be operated using devices such as smartphones or tablets via the integrated web remote interface, when connected to the same network. Based on a Beckhoff PC, R90 functionality can also be extended by a third party to provide custom project-related features.

Connector types

USB	LAN1	Power	Ground
X104, X105	X102	X101	M4

System Integration

General operation R1/PC

R90 Touchscreen remote control

Mixer

DS10

Amplifier

Amplifier

Amplifier

Restaurant

Terrace

DJ Monitor

Dance floor

NETWORK
Dante

AES70/OCA

AUDIO
Analog

AES

---

1. Create

AmpPresets for each application scenario using R1.

2. Connect

R90 to the d&b Remote network. To add amplifiers, enter their IP address and check for the same subnet mask.

3. Configure

Project settings as needed: define AmpPresets and assign groups with channel levels and mutes.

4. Confirm

Once changes have been applied, the R90 is instantly ready to use.

| Performance requirements | The d&b ArrayCalc simulation software **Planning and simulation** External simulation software | The d&b Remote control solutions **Operation** Third-party integration | The d&b amplifiers **Processing and distribution** The d&b Network audio solutions | The d&b loudspeakers **Reproduction** |
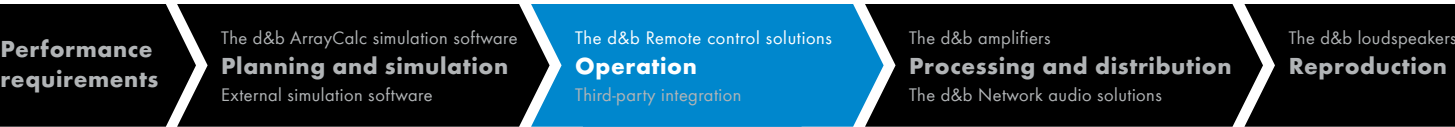
Third-party integration and interoperability.
General control and monitoring.

Overview
To ensure that a d&b system satisfies the demands of general operation, status monitoring or emergency situations, a broad range of plug-ins are available to interoperate with media control systems from different manufacturers.

Third-party integration with media control for AV

With third-party control, you can adjust the power status or level of the complete system, or of a single zone. If parts of the solutions are not needed, you can easily mute them.

The d&b amplifiers provide Input and Load monitoring functions and System check to ensure that the system performs exactly as intended by monitoring the signal from the input source through to the loudspeaker.

The Fallback and Override functions guarantee that emergency and secondary signals are transmitted when required, automatically switching from program material to a defined input source.
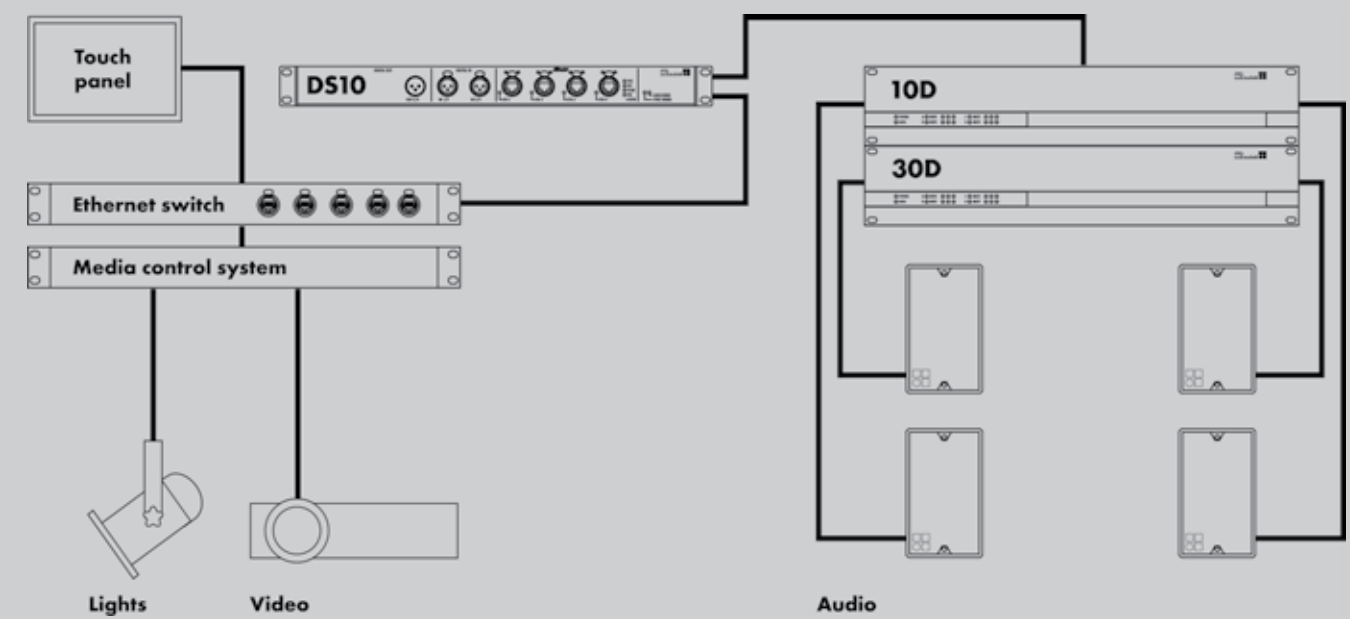
Programmable five-pin General Purpose Input/Output ports (GPIO) provide one method of control and monitoring for external devices.

AmpPresets can be stored to switch the system configuration to different applications or program types. All user settings, such as input, output, channel configurations, and EQ and delay settings, are changed automatically when an AmpPreset is recalled.

Interoperable features
- Power
- Mute
- Change input settings (Fallback, Override)
- Change AmpPresets
- Load monitoring, Input monitoring
- Indication of amplifier status, fault monitoring

Solutions
d&b continuously develops new integration solutions for third-party control and monitoring. The current portfolio includes plug-ins for system controllers from manufacturers including:

d&b plug-in solution portfolio for third-party integration for amplifiers

Third-party integration with the DS100 Signal Engine
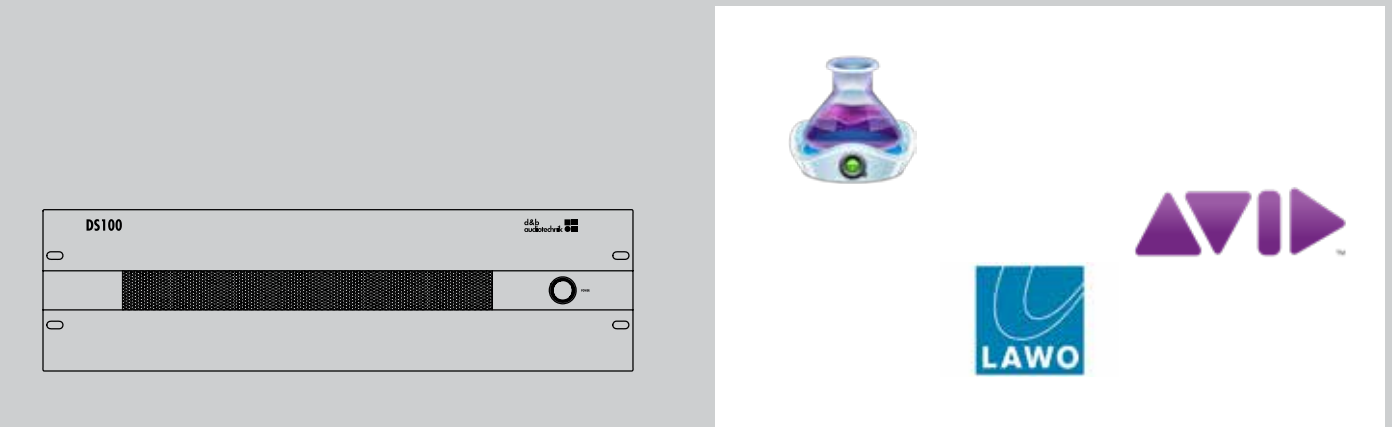
| Performance requirements | The d&b ArrayCalc simulation software **Planning and simulation** External simulation software | The d&b Remote control solutions **Operation** Third-party integration | The d&b amplifiers **Processing and distribution** The d&b Network audio solutions | The d&b loudspeakers **Reproduction** |

Third-party integration solution.
Q-SYS.

Q-SYS is an audio DSP, signal distribution and control network solution from the audio manufacturer QSC, controlled using processing cores and programmable user interfaces. All control and signal processing functionalities within a network can be customized to the exact requirements of the application, while user interfaces on touchscreens can provide tailored controls for any user.

The d&b plug-in module for the Q-SYS DSP network allows full integration of the Ethernet-compatible d&b amplifiers in the Q-SYS control network domain. In combination with Q-SYS, a d&b loudspeaker system is the ideal solution for any permanent installation demanding the highest audio performance and fully customizable remote-control capabilities, regardless of the size, shape or scale of the project.

Parameters can be adjusted using Q-SYS control components and indicators and are customized via the Q-SYS designer software. This permits full system control and status monitoring on any QSC control device, or via any Q-SYS control interface. d&b sound reinforcement systems are then fully operable in a system environment designed for intuitive and easy everyday handling for all users and for performances of any kind. With the flick of a switch, a normally unattended audio system intended for natural speech reproduction - at the highest intelligibility - can become a full blooded loudspeaker system for music and live program reproduction fulfilling every concert and performance expectation.

The embedded Q-SYS system status logging function also provides options for automated notifications for system events and errors by email, while the LUA scripting feature permits comprehensive Q-SYS programming.

System requirements
- Ethernet-compatible d&b amplifiers (10D, 30D, D20 or D80) with Firmware V2.02.00 or higher
- QSC Q-SYS system and Q-SYS Designer V5.1.00 or higher
- Q-SYS Designer project file containing the d&b Q-SYS plug-in module
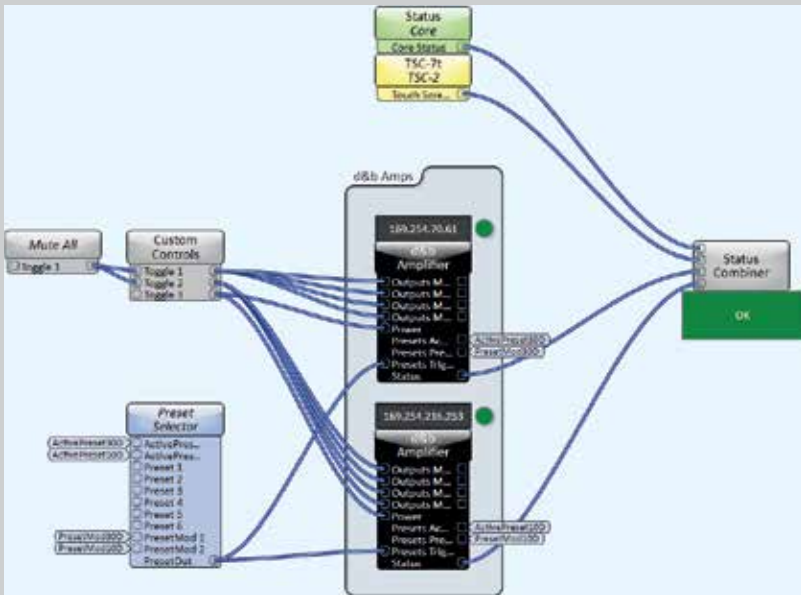
Q-SYS Designer

d&b plug-in for Q-SYS
Remote view

Plug-in capabilities
- Device
  - Power the amplifier on and off
  - Track the amplifier's Power and Error status
  - Set the amplifier name
  - Physically identify an amplifier
- Outputs
  - Channel output gain and mute control
  - Level metering for each channel, including ISP (Input Signal Present), GR (Gain Reduction), and OVL (Overload)
  - Set each amplifier channel's name
  - Supervise each channel's error status individually
- Amplifier presets
  - Backup and load presets
  - Fire presets immediately via a Q-SYS control pin
  - Track the modified status of currently active preset
- Monitoring
  - Enable/disable Input monitoring for each individual input
  - Enable/disable Load monitoring for each individual output
  - Clear Input monitoring or Load monitoring errors
  - Input fallback and override settings
- Log events such as device disconnects and communication errors to the QSC Core Event Log

The d&b control plug-in for Q-SYS, as well as detailed technical information, is available for download from www.dbaudio.com.

Veltins-Arena with Q-SYS.

Veltins-Arena, Gelsenkirchen, Germany
The stadium previously known as "Arena Auf Schalke" is one of the most prestigious stadiums in Germany, located in Gelsenkirchen (North Rhine-Westphalia). The venue's name changed to "Veltins-Arena" in 2005. The stadium is home to the very traditional soccer club FC Schalke 04. The venue opened in 2001 and has a capacity of 62,271 seats. The most remarkable character of the stadium is the unique construction of a completely retractable roof to change from an open arena to a completely closed venue. Therefore, it is also very popular for large concerts and touring productions.

The arena hosts about 2.4 million guests per year and expectations are very high. Highest sound quality is a must for multipurpose venues such as this. The scope of use is extensive and the entertainment aspect of soccer games is becoming as important as the use of the audio system for concerts, or any other kind of event.

Equipment list
- 14 hangs, 12 tops + 2 x V-SUB flown behind
- 168 x Vi8
- 28 x V-SUB
- 56 x Vi7P (40 x delay for upper tier, 16 x pitch)
- 74 x 30D amplifier

Owner
FC Schalke 04 - Stadion Beteiligungsgesellschaft mbH & CO Immobilienverwaltungs-KG

Design
Graner und Partner Engineering, Germany

Integration
Stage systems, Germany
Salzbrenner Media, Germany
d&b audiotechnik GmbH, Germany

System requirements
- d&b system integration with Q-SYS for general operation and monitoring
- Comprehensive redundancy with signal fallback and seamless hardware exchange /replacement in case of a faulty amplifier
- Switch between different event scenarios with a single button
- 24/7 system control and monitoring for audio signal input and load monitoring (status of every loudspeaker)
- SPL reduction only for the press area
- Decrease reflections from empty stands
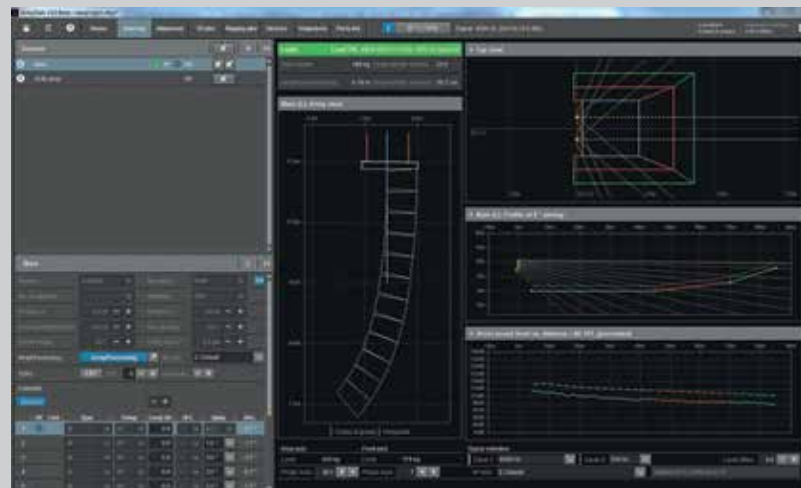- Special loudspeaker colors and weather-resistant finish

Veltins-Arena with Q-SYS.

Audio solutions

- d&b ArrayProcessing individually optimizes level and tonality for the entire audience in different areas
- Individual level correction over distance to reduce reflections from walls and glass panels
- Frequency response correction due to changing air absorption (depending on temperature and humidity)
- Smooth transition from main system to delay systems
- Switchable ArrayProcessing presets to reduce direct sound level for press stall (less background noise on the broadcast signal) without interfering the audio performance for the audience nearby

What the customer says:
"…We`ve invested in the future and probably the best system available on the market today. d&b convinced us right from the beginning with the preparation and in the shootout with the best sound performance and during the commissioning with our integrator. We are very delighted with the result and proud about what we archived…" **Bernd Funke, Technical director Veltins-Arena**

ArrayProcessing simulation

ArrayCalc Main (left) array overview

Integration solutions with general processing platform Q-SYS

- Input monitoring of audio signal and Fallback function in case of signal failure
- Load monitoring of loudspeaker status every 100 seconds
- Switchable AmpPresets for different event scenarios
- Amp failure detection with seamless signal switch to spare amplifier in case of general error, loss of network connections, amp module failure, power loss, etc.

Third-party integration solution.
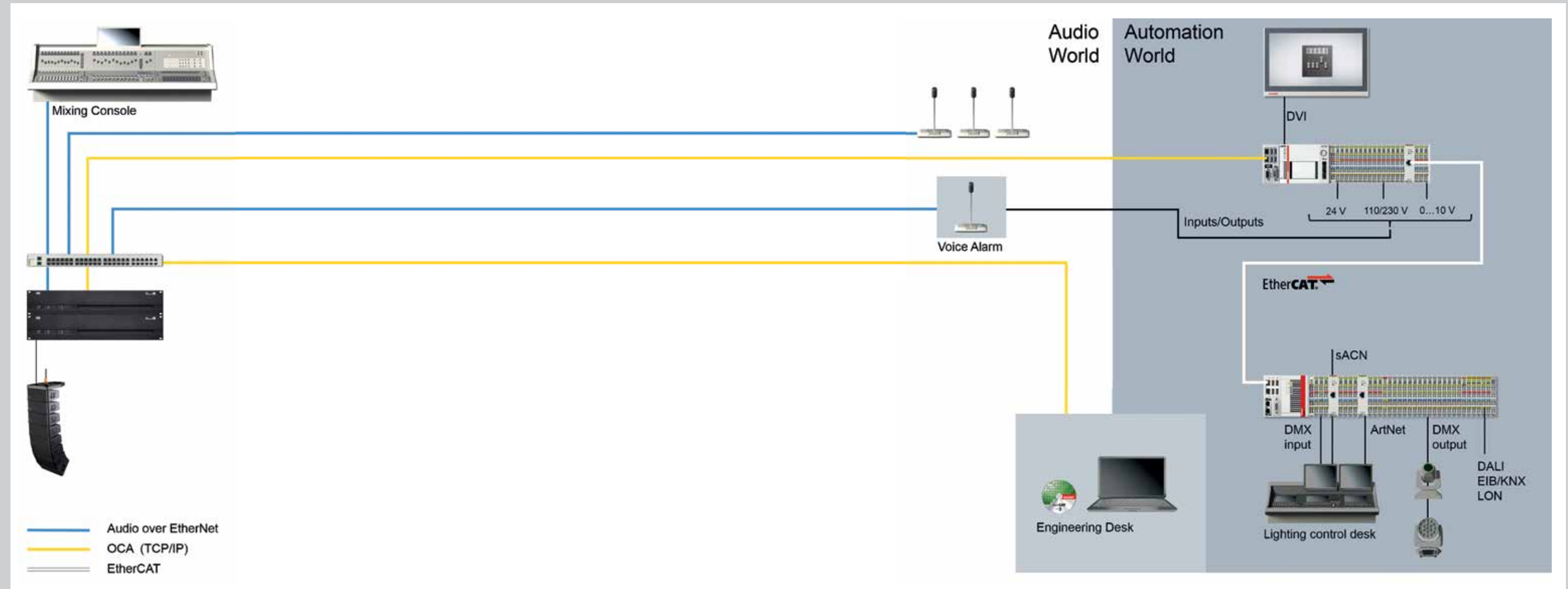# Beckhoff.

Beckhoff intergration solution for AV

PC-based control technology from the specialists at Beckhoff offers a comprehensive range of modular components for all automation tasks. The open and flexible Beckhoff automation platform is ideal for enabling integrated control of all functions in stage, show and AV media technology: from movable objects, lighting and AV media technology, through to building automation.

A customized application structure enables complete integration of the installation-specific d&b 10D and 30D amplifiers as well as the D20 and D80 amplifiers in the Beckhoff control system.

The Beckhoff TwinCAT software system defines a real-time controller with a multi-PLC system, NC axis control, programming environment, and operating station. The d&b function blocks in TwinCAT provide access to d&b amplifier parameters, such as Gain and Mute status, recall AmpPresets, or change the Power On/Off status. In addition, it can access all the other OCA parameters of a d&b amplifier and can read several types of information from the amplifier, including Input monitoring, Load monitoring, and amplifier status. d&b sound reinforcement systems become fully interoperable in a system environment designed for intuitive and easy everyday handling by all users and for performances of any kind.

Offering more than 400 signal types, the Beckhoff I/O system covers the entire range of actuators and sensors, from digital and analog standard signals through to the integration of lighting equipment, motion control, building auto-mation and AV media control.
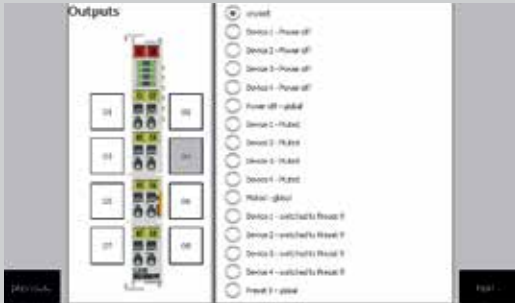
Third-party integration solution.
Beckhoff.

With OCA (AES 70), DMX, sACN, SMPTE Timecode, Art-Net™ and PosiStageNet, Beckhoff "speaks" the languages of the industry, ensuring that the most varied areas of stage and show technology can be controlled on basis of standard control components. System integrators can choose the solution that best suits their applications in terms of performance and cost from the comprehensive portfolio of modular automation components.

The d&b system can be switched from playback, to announcements with the highest intelligibility to a highly dynamic system for music and live program reproduction, fulfilling every concert and performance expectation. Stadiums, houses of worship, performing art venues, corporate auditoriums and large event spaces all demand the highest level of performance, intelligibility, flexibility and ease of operation. PC-based control technology allows high-performance d&b amplifiers to become part of a large integrated automation platform.

The acoustical distribution of the d&b audio experience becomes infinitely reconfigurable, while ease of operation allows users to select the perfect system operating mode.

Using the Beckhoff TwinCat3 system design software to customize solutions for every project - the sky is the limit.

For some applications, a compact standard solution provides quick general operation for up to 14 amplifiers in one system. This package consists of a 7" touchscreen PC with mounting frame, two I/O terminals and software licenses pre-installed.

Amplifier configuration

Amplifier output configuration

d&b plug-in for Beckhoff
Remote overview

d&b plug-in for Beckhoff
Amplifier overview

The d&b control module for Beckhoff as well as detailed technical information is available to download from www.dbaudio.com.

De Factorij with Beckhoff.

Cultural Center 'de Factorij', Zaventem, Belgium

The Belgian national airport: Everybody calls it Brussels Airport, although the airport is located in Zaventem. Thinking about that, we are not going to call this new theater Brussels Cultural Center. Brussels is not big enough to capture the scope of this state-of-the-art venue.

Equipment list
- 3 x Yi-SUB, 8 x Yi8, 2 x Yi12 (main array per side)
- 2 x V-GSUB (SUBs per side)
- 2 x Yi10P (downfill)
- 2 x Yi7P (outfill)
- 4 x E5 (lipfill)
- 10 x 8S (surround)
- 9 x 30D amplifier
- 2 x 10D amplifier (surround)
- 12 x M4 monitor
- 3 x D20 amplifier
- 4 x DS10 Audio network bridge

Equipment list - The multipurpose venue
- 2 x V7P
- 2 x V10P
- 4 x V-GSUB
- 2 x D80 amplifier

Owner
City of Zaventem
Cultuurcentrum De Factorij
www.ccdefactorij.be

Consultant
TTAS – Marc Lambert
www.ttas.be

Design and integration
Amptec, Diepenbeek
Responsible TU: Steven Aerts & Frank Geerts
www.amptec.be

Challenge

'De Factorij' has a multipurpose hall and a theater with 680 seats. The acoustic consultant designed a nearly perfect acoustic environment for speech and music.

The shape of the theater contains some challenges for sound reinforcement. It is fairly wide, high and not very deep, with high and steep seating. An eight-by-two-meter glass window is centrally positioned between the stalls and the balcony. The window serves as sound insulation for the control and projection room. The balcony has small aisles next to the side walls of the venue, placing a small number of audience members very close to the stage. Designing a line array for this style of theater was extremely difficult.

Requirements for integration

'De Factorij' utilized the d&b audiotechnik R1 V2 Remote control software as a 'fast and efficient' way to control the complete system. Combined with Dante Controller for changing the audio patch, it is a neat solution.

De Factorij with Beckhoff.

Audio solutions

The first designs for 'de Factorij' were made just when d&b launched ArrayProcessing. With ArrayProcessing enabled, the level at the glass surface can be reduced to avoid reflections, and tonality remains constant throughout the steeply raked audience area.

A Dante network provides audio signal transport throughout the venue. Amptec installed a cinema sound processor to provide DTS surround sound to reach the Dante network, and in one way or another, all consoles and amplifiers are connected to the redundant CISCO switches and four d&b DS10 Audio network bridges.
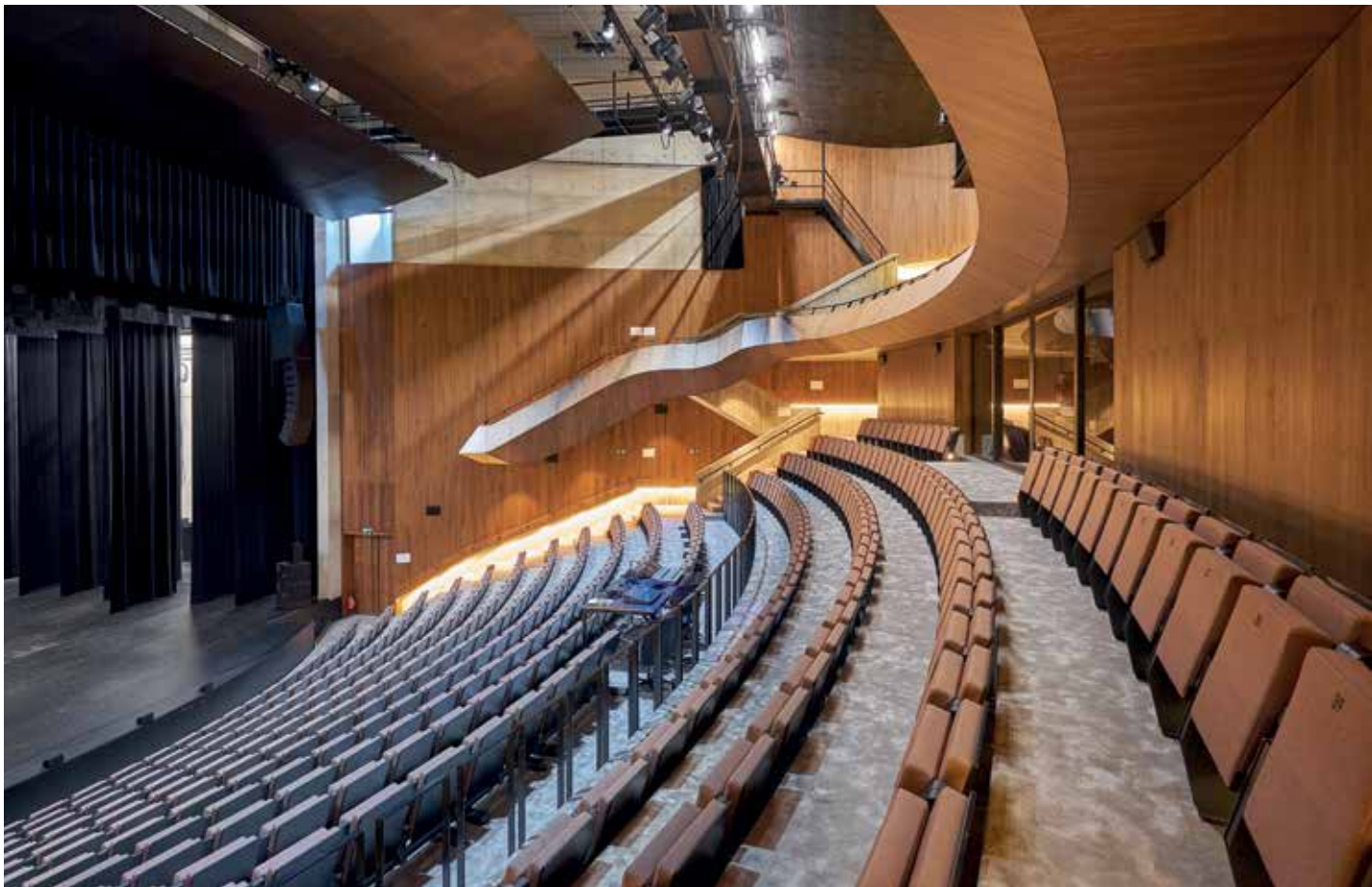
Integration solutions using Beckhoff

For Amptec, 'fast and efficient' meant an additional touchscreen solution that allows simple preset recall with an industrial PLC from Beckhoff. A speech or a movie projection can be activated by a touch on the screen. Recallable presets include amplifier settings and Dante patch presets. This touchscreen interface is programmed in HTML5. Presets can even be activated through a web browser on a smartphone. Dante patch presets are prepared in Dante Controller and exported to the PLC with a USB stick. d&b amplifier presets are stored on board the amplifier and recalled by the PLC through OCA/AES70 or GPIO.

Activate Cinema?
Activating the Cinema setup

Cinema Active
Main venue

PA Digital Active
Main venue

Third-party integration solution.
Crestron.

Crestron is a media control network solution for monitoring, managing and controlling meeting spaces and building automation, such as A/V, lighting, IT and security. The system allows the user to monitor, manage, and control everything from one platform. A Crestron system consists of different devices including management processors, I/Os, switches, touch screens and panels to manage custom solutions.

The Crestron module allows system designers and integrators to define their own custom user interface for a d&b system. By means of the d&b Crestron module, the user interface can be connected to any Ethernet-compatible d&b amplifier and it can then be accessed via the Crestron control network. In combination with Crestron media control, a d&b loudspeaker system is the ideal solution for any permanent installation demanding the highest audio performance and fully customizable remote control capabilities, regardless of the size, shape or scale of the project.

The d&b Crestron module can provide access to d&b amplifier parameters, such as Gain and Mute status, recall AmpPresets or change the Power On/Off status. It also reads several types of information from the amplifiers, including Input monitoring, Load monitoring and amplifier status.

System requirements
▪ Ethernet-compatible d&b amplifiers (10D, 30D, D20 or D80) with Firmware V2.02.00 or higher
▪ Hardware controller: Crestron 3-Series control engine
▪ Development tool: SIMPL Windows (V4.06.01 or higher)
▪ Touch panel designer: VisionTools Pro-e

Crestron touch panel designer
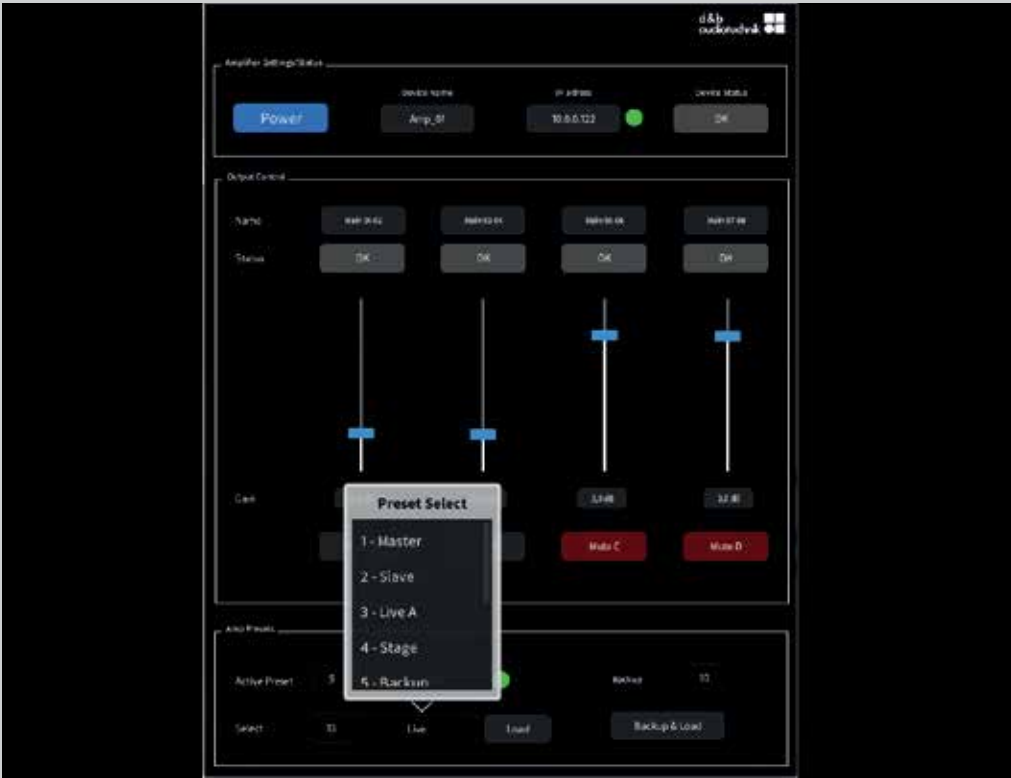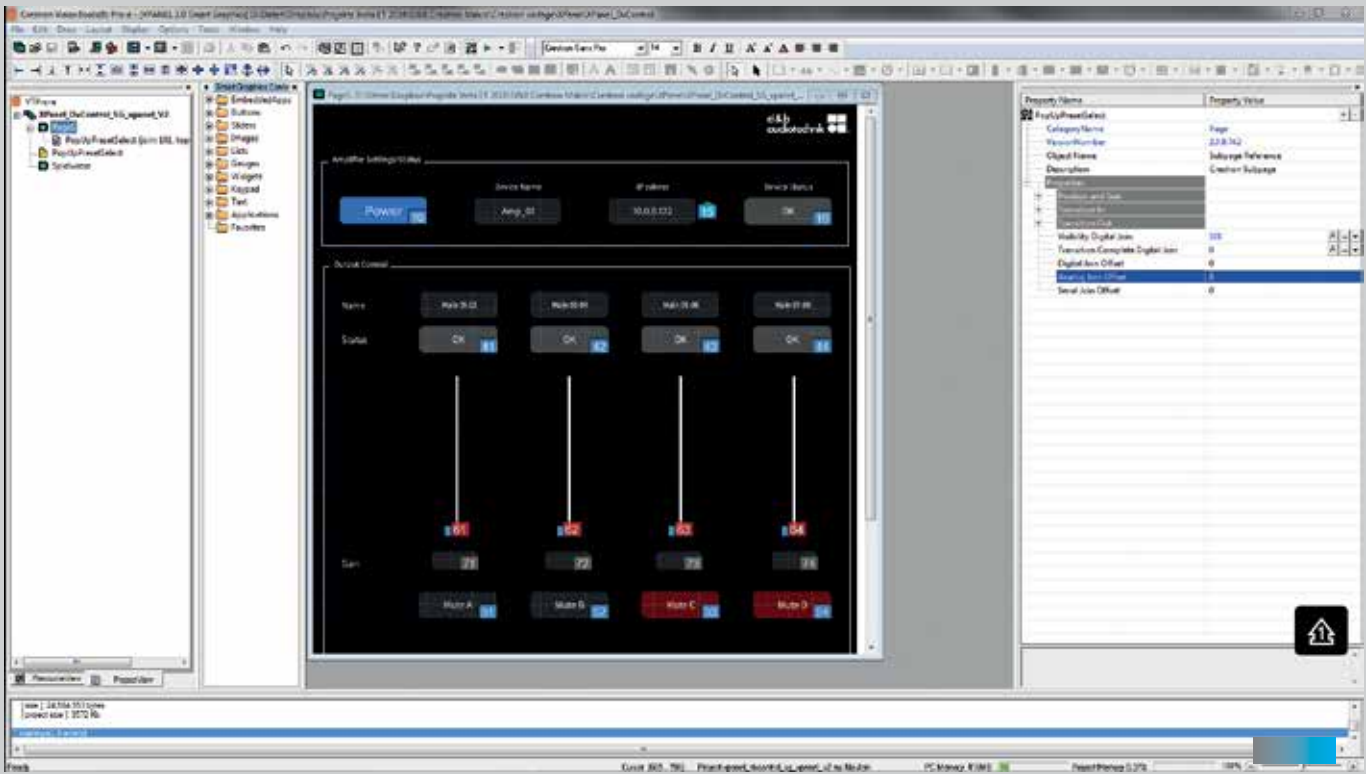
d&b plug-in for Crestron Amplifier view

Plug-in capabilities
▪ Device
  ▪ Power the amplifier on and off
  ▪ Track the amplifier's Power and Error status
  ▪ Read the amplifier name
▪ Outputs
  ▪ Channel output gain and mute control
  ▪ Supervise each channel's Error status individually
  ▪ Monitor the amplifier channel temperature
▪ Amplifier presets
  ▪ Backup and load presets
  ▪ Track the modified status of currently active preset and display its name
▪ Monitoring
  ▪ Enable/disable Input monitoring for each individual analog and digital input
  ▪ Enable/disable Load monitoring for each individual output
▪ Log events such as device disconnects and communication errors

The d&b control module for Crestron and detailed technical information are available for download from www.dbaudio.com.

Municipal hall in Quadrium with Crestron.

The municipal hall at the Quadrium in Wernau
The Wernau municipal hall is part of the Quadrium, a conference and administration center in Wernau. The Wernau municipal hall consists of a 540 m² multipurpose venue, which can be divided into two separate rooms.

Event profiles
The hall plays host to a wide variety of events from conferences, conventions and weddings to theater and music events. This diverse venue requires a flexible and innovative PA system which produces high-quality, uniform speech intelligibility, while also having enough output reserve for music performances.

Challenge
Installation of new loudspeakers and amplifiers with integration in a third-party control system.

Requirements for media control systems
This multi-purpose venue requires a flexible PA system to produce high-quality and uniform speech intelligibility, while also having sufficient output reserve for music performances. A crucial part of the selection process, alongside the requirement for integration, was a high directivity loudspeaker system that could provide equal SPL throughout the audience area, while reducing the likelihood of acoustic feedback. The whole system should be easy to operate through a central media control interface: turning the equipment on and off, operating the curtains and lighting, choosing the individual audio settings, etc.

The PA system must be connected to an EVAC system so that the main system can be silenced in case of emergency. Another important factor is a single point of operation so that the in-house technicians do not have to master multiple different systems.

d&b equipment list of loudspeakers/amps
- 1 x Y10P
- 14 x Yi8
- 2 x Yi7P
- 2 x Yi-SUB
- 5 x 30D
- 2 x 10D
- 2 x DS10 Audio network bridge

Client
Wernau city authority

Designer
Meine Mediatec GmbH, Wernau (Neckar)

Integrator
eventtechnik GmbH, Metzingen

Municipal hall in Quadrium with Crestron.

Audio solutions

Uniform SPL for the whole audience area was an important factor to meet the requirements of different audio environments. This was achieved using d&b ArrayProcessing.


Media control system integration
- 3 remote touchscreens to operate the room equipment (1 wired in the control room, 1 wired in the main hall and 1 wireless in the main hall)
- The lighting in the hall (chandeliers, ceiling spots, etc) is connected to the atmospheric dimmer system and is operated via a light desk, as well as the media control system
- Switch contact for individual offsets, as well as for blue light and access lights
- Operation of PA system

Power, mute, four amp presets for different types of sound provision:
- Room divided up or used as a whole, with or without a gallery
- Mode for operating the sound console
- Mode for simplified operation of sound console (only full mixes are distributed to the rooms)
- Mode for technical laymen (without sound console, just audio DSP via Crestron Touch Screen)
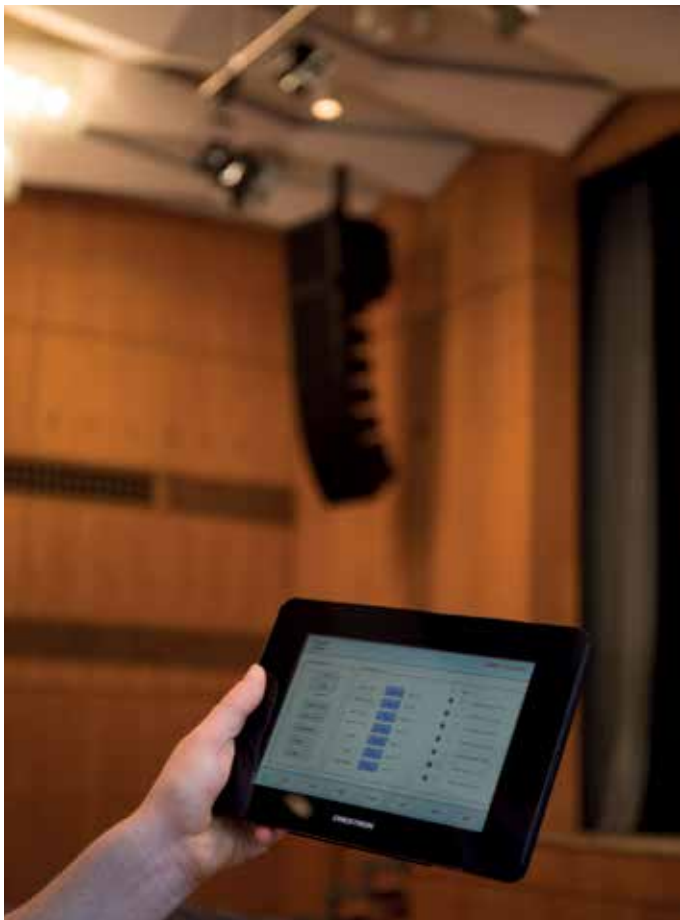
What the customer says:

"We're very happy with the result. d&b is one of the most recognized suppliers on the market. With the new installation, we will meet the requirements of a wide variety of guest productions, whose technicians would rather avoid setting up and using their own equipment, and will thereby save time and money. We did not find technology that could give results that were this effective from any other supplier. People have already praised the excellent speech intelligibility, which is even the case in areas at the back of the room that previously posed problems, and the general sound quality is extremely high. We notice it at our own events, and also receive feedback to that effect from external technicians. It's possible to easily adapt the system to different event profiles and control it at the touch of a button - even with a wireless touch screen from any point in the room."

Peter Dengler, On-site Technical Manager

What the integrator says:

"The System planning took place using the d&b Workflow, which made the implementation much easier. Integrating the PA system into the technology within the hall was achieved by using the Crestron Plugin provided by d&b. In this way, controlling, operating and monitoring the central amplification functions alongside the rest of the system was made simple and efficient by the Crestron media control system."

Tom Ulbrich (Dipl. Ing.)

Third-party integration solution.
MediaMatrix.

Peavey MediaMatrix is a digital audio distribution and processing system with fully flexible control functions. Powerful digital processors, software and user-control tools provide audio system integrators with comprehensive flexibility to design the signal distribution and control network by a computer, while user interfaces on touch-screens or iOS devices provide tailored controls for any user. The system can also be controlled using wall panels and GPIOs.

The d&b plug-in module for the MediaMatrix DSP network allows the full integration of installation specific d&b 10D and 30D amplifiers, as well as the D20 and D80 amplifiers, in the MediaMatrix control network domain.
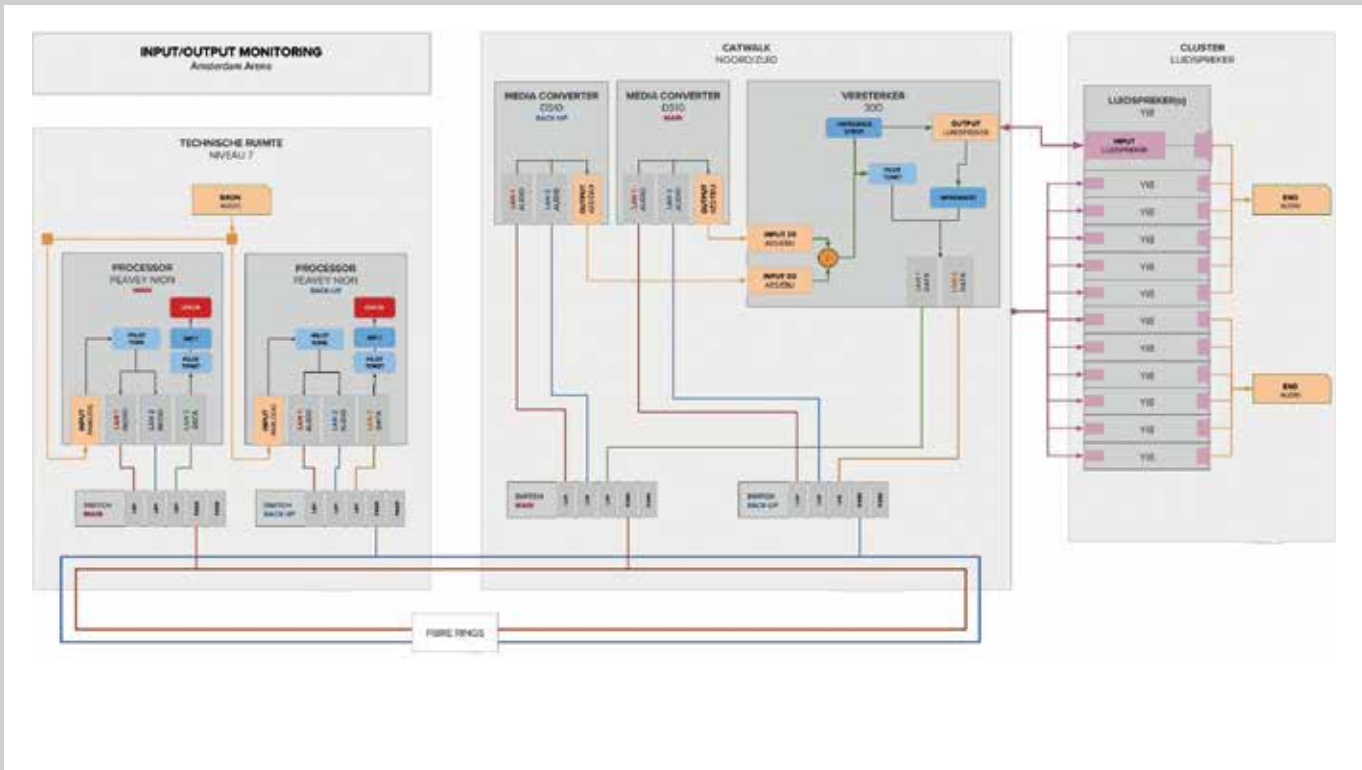
The complete system is designed and managed using the NWare software, and then deployed to NION or nControl processing devices within the network. All system parameters can be adjusted via NWare, which can also provide complete status monitoring features and full system control via a MediaMatrix control device, or via a control interface for Android, iOS (Apple), Blackberry, Windows or Linux mobile devices. Extensive integration with the MediaMatrix range also allows the status logging of all audio connections to amplifiers, and the operating state of the monitored loudspeakers.

The d&b NWare™ plug-in allows the control and monitoring of a number of functions of the d&b 4 channel amplifiers (10D, 30D, D20 or D80) from within the Peavey MediaMatrix® framework using Open Control Architecture (OCA/AES70).

System requirements
▪ Ethernet-compatible d&b amplifiers (10D, 30D, D20 or D80) with Firmware V2.02.00 or higher
▪ Peavey MediaMatrix system and NWare software version 1.7.2 or higher
▪ Nion Project plug-in (*.npp) file containing the d&b plug-in module for 10D, 30D, D20 and D80 amplifiers

d&b plug-in for MediaMatrix
Amplifier view

Plug-in capabilities
▪ Device
  ▪ Power the amplifier on and off
  ▪ Track the amplifier's Power and Error status
  ▪ Read the amplifier name
▪ Outputs
  ▪ Channel output gain and mute control
  ▪ Supervise each channel's error status individually
  ▪ Monitor the amplifier channel temperature
▪ Amplifier presets
  ▪ Backup and load presets
  ▪ Track the modified status of currently active preset and display its name
▪ Monitoring
  ▪ Enable/disable Input monitoring for each individual analog and digital input
  ▪ Enable/disable Load monitoring for each individual output
▪ Log events such as device disconnects and communication errors

The d&b control module for MediaMatrix as well as detailed technical information, is available to download from www.dbaudio.com.

MediaMatrix Nion Designer Software

Amsterdam ArenA with MediaMatrix.

Amsterdam Arena, Netherlands
Amsterdam ArenA is home to AFC Ajax, the Dutch football team's international fixtures and provides a stop-off point for touring artists, including names such as Coldplay and U2.

What the customer says.
"Through our research we observed that for a significant number of years d&b has been identified as number one, with three other close contenders, all of whom were invited to tender. The quality of our new d&b system is not just a few steps up in terms of sonic delivery, there are other benefits, not least massive savings in power consumption," says Oosterop. "The old system, to comply with evacuation regulations, had to be on 24/7. With the new solution it can be off when not in use. Not only that, for smaller events where just part of the stadium is used, the system is zoned, so we have default programmes within the evacuation control customized for us, that trigger the evacuation system to move people out zone by zone. "Not only is sound improved throughout the venue, audio power consumption has reduced by 85%. Not only is that a huge financial impact, it's also a great ecological result. One of the arena's aims is to be carbon neutral; we already have solar panels and wind turbines in place. Now we are one step closer."
Tim Oosterop, Venue Manager

Challenge
- Addressing the issue of atypical acoustics, difficulties that could not be solved - in realistic financial terms - by current construction techniques
- The system needs to serve three different scenarios: concert delay support, football matches and voice evacuation with seamless operation

System requirements
- Regulation compliance including Dutch national regulations and specific UEFA/FIFA requirements for performance and intelligibility
- Compliance with national and international safety standards for evacuation systems
- Enhancing the venue's reputation as a host of other entertainment events - especially concerts - with an acknowledged leading audio brand

d&b equipment list
- 216 x Yi8 (18 arrays)
- 54 x 30D
- 8 x DS10

Owner
AFC Ajax
Responsible Venue Manager: Tim Oosterop

Consultancy
Roland Hemming, rh consulting, UK

Design and Integration
Ampco-Flashlight, Utrecht, Netherlands
d&b audiotechnik GmbH, Germany
Responsible TU, Olaf Landzaat

Amsterdam ArenA with MediaMatrix.

Audio solutions

The application utilizes innovative d&b ArrayProcessing technology to create the best tonal balance and covering in various situations. When there is a concert, the system can be used as a delay system. The arrays can be mechanically rotated to position them in line with a stage PA on the north side.

d&b plug-in for MediaMatrix
AmpPreset overview

Integration solutions

d&b R1 Remote control software was used for the initial setup and in case we needed to change AmpPresets and ArrayProcessing settings to meet the latest requirements, but these settings should not be accessible to any user. Interoperability with MediaMatrix was implemented using the d&b MediaMatrix plug-in for comprehensive operation of the three different scenarios, redundancy, and evacuation situations, all with a maximum of reliability and efficiency.

The MediaMatrix monitors all system functions and devices, from inputs to outputs, and network ports to amplifiers. The d&b amplifiers monitor the correct operation of all connected loudspeakers constantly. The main MediaMatrix set and the backup set monitor every device and connection in the system constantly - the entire system is redundant.

Presets set the Input levels, EQ, delays and AmpPresets (with the correct ArrayProcessing slot).
For smaller matches, the audio engineer can use 2 other ArrayProcessing settings.
▪ Lower part only (1st ring)
▪ Upper part only (2nd ring)

On 30D amplifiers, we use Input monitoring to check for pilot tone presence on all inputs.
The Input fallback in the 30D is used to switch automatically from the main inputs to the backup in case the pilot tone drops below the threshold. Dante routes the audio signal to the amplifier racks that are installed at two different positions on the catwalk. The d&b DS10 is used to convert the Dante signal to AES3, which in turn feeds the amplifiers. The whole setup is implemented twice, one Main and a Backup all the way to the amplifiers.

MediaMatrix Nion
application views

Third-party integration solution.
AMX.

AMX is a media control network solution for monitoring, managing and controlling meeting spaces and building automation such as A/V, lighting, IT and security. The system allows the user to monitor, manage, and control everything from one platform. A system consists of different devices including management processors, I/Os, switches, touchscreens and panels to manage custom solutions.

The AMX framework enables system integrators to define their own custom user interface. By means of the d&b AMX module, the user interface can be connected to any Ethernet-compatible d&b amplifier and can access it via the AMX control network.

In combination with AMX media control, a d&b loudspeaker system is the ideal solution for any permanent installation demanding the highest audio performance and fully customizable remote-control capabilities, regardless of the size, shape or scale of the project.

The d&b AMX module can provide access to d&b amplifier parameters such as Gain and Mute status, recall AmpPresets or change the Power On/Off status. It also reads several types of information from the amplifiers, including Input monitoring, Load monitoring and amplifier status.

The AMX framework allows system integrators to define their own custom graphical user interface (GUI) in the TPDesign software. By means of NetLinx Studio the GUI controls can be connected to d&b audiotechnik amplifiers via Ethernet. The Direct communication with the amplifiers is handled by the d&b communication module.

System requirements
▪ Ethernet-compatible d&b amplifiers (10D, 30D, D20 or D80) with Firmware V2.02.00 or higher
▪ Hardware controller: AMX NetLinx NX-1200 or higher
▪ Development tool: AMX NetLinx Studio 4
▪ Touch panel designer: AMX TPDesign4

AMX designer
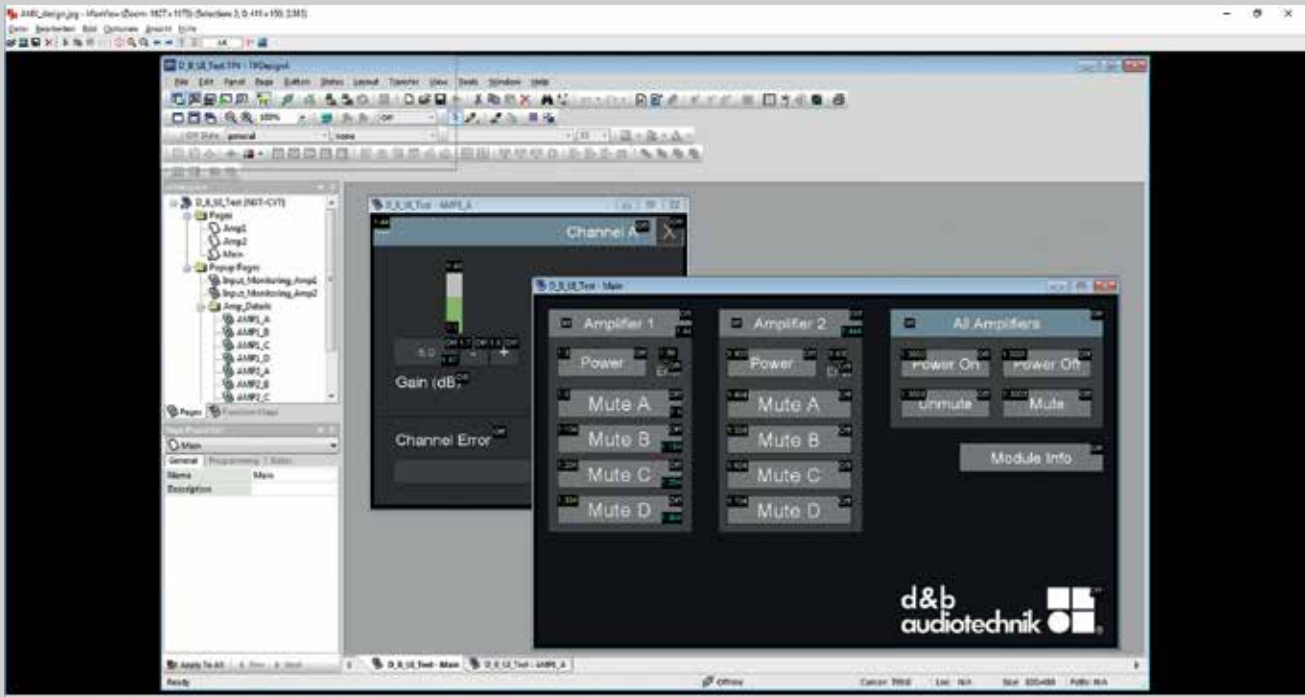
d&b plug-in for AMX
Amplifier view

AMX channel view

AMX input monitoring view

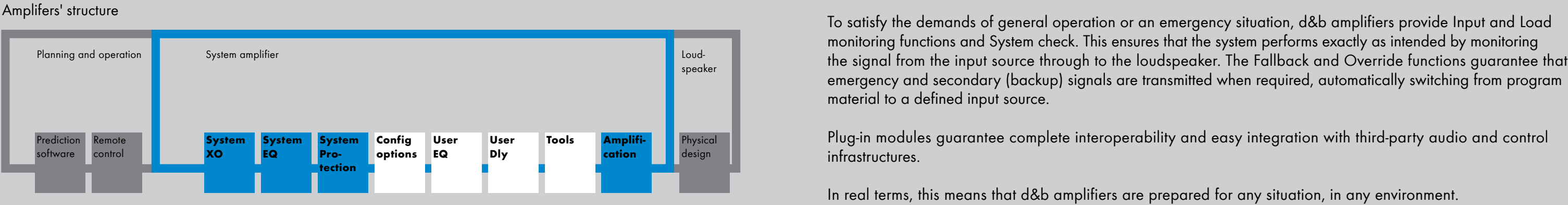**Plug-in capabilities**
▪ Device
  ▪ Power the amplifier on and off
  ▪ Track the amplifier's Power and Error status
  ▪ Read the amplifier name
▪ Outputs
  ▪ Channel output gain and mute control
  ▪ Supervise each channel's error status individually
  ▪ Monitor the amplifier channel temperature
▪ Amplifier presets
  ▪ Backup and load presets
  ▪ Track the modified status of currently active preset and display its name
▪ Monitoring
  ▪ Enable/disable Input monitoring for each individual analog and digital input
  ▪ Enable/disable Load monitoring for each individual output
▪ Log events such as device disconnects and communication errors to the AMX log
  ▪ Four log levels ERROR, INFO, WARNING and DEBUG to filter log messages by significance

The d&b control module for AMX and detailed technical information are available for download from www.dbaudio.com.

Processing and distribution.
d&b System amplifiers.

Amplifiers' structure

Planning and operation | System amplifier | Loud-speaker

Prediction software | Remote control | System XO | System EQ | System Pro-tection | Config options | User EQ | User Dly | Tools | Amplifi-cation | Physical design
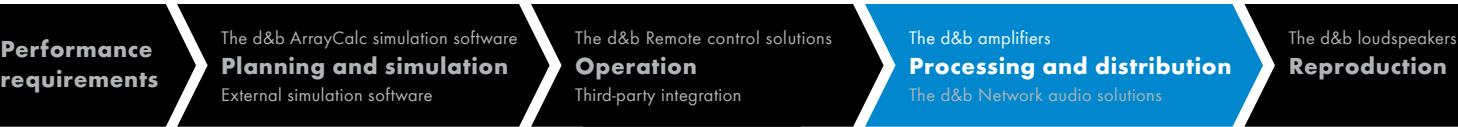
The d&b System amplifiers are designed for permanent installation for full integration within their surroundings. The Digital Signal Processing power provides comprehensive loudspeaker management to meet the venue's requirements. These include switchable filter functions, remote capabilities and user-definable controls, as well as enhanced system status monitoring features.

To satisfy the demands of general operation or an emergency situation, d&b amplifiers provide Input and Load monitoring functions and System check. This ensures that the system performs exactly as intended by monitoring the signal from the input source through to the loudspeaker. The Fallback and Override functions guarantee that emergency and secondary (backup) signals are transmitted when required, automatically switching from program material to a defined input source.

Plug-in modules guarantee complete interoperability and easy integration with third-party audio and control infrastructures.

In real terms, this means that d&b amplifiers are prepared for any situation, in any environment.

Amplifiers	10D	30D	D80	D6
User interface	LED indicators	LED indicators	Encoder / colour TFT touchscreen	Encoder / LC display
Input channels	4 x AES3 and 4 x analog	4 x AES3 and 4 x analog	4 x AES3 or 4 x analog or 2 x AES3 and 2 x analog	2 x AES3 or 2 x analog
Output channels	4	4	4	2
Output connectors	Phoenix Euroblock	Phoenix Euroblock	NL4 / EP5 plus central NL8	NL4
Output routing	Dual Channel, Mix TOP/SUB and 2-Way Active	Dual Channel, Mix TOP/SUB and 2-Way Active	Dual Channel, Mix TOP / SUB and 2-Way Active	Dual Channel
Rated output power (THD+N < 0.5%, 12 dB crest factor)	4 x 350 W into 8 Ω / 4 x 700 W into 4 Ω	4 x 800 W into 8 Ω / 4 x 1600 W into 4 Ω	4 x 2000 W into 8 Ω / 4 x 4000 W into 4 Ω	2 x 350 W into 8 Ω / 2 x 600 W into 4 Ω
Cable compensation	LoadMatch	LoadMatch	LoadMatch	
Latency	0.3 ms	0.3 ms	0.3 ms	0.3 ms
Delay	10 sec / 3440 m	10 sec / 3440 m	10 sec / 3440 m	340 msec / 116.9 m
User equalizers (per channel)	2 x 16-band	2 x 16-band	2 x 16-band	4-band
Remote	OCA/AES70 via Ethernet/CAN	OCA/AES70 via Ethernet/CAN	OCA/AES70 via Ethernet/CAN	CAN
Power Supply	Universal range switched mode power supply with active PFC	Universal range switched mode power supply with active PFC	Autosensing switched mode power supply with active PFC	Autosensing switched mode power supply with active PFC
Mains voltage	100 - 240 V, 50 - 60 Hz	100 - 240 V, 50 - 60 Hz	100 - 127 / 208 - 240 V, 50 - 60 Hz	100 - 127 / 208 - 240, 50 - 60 Hz
Dimensions (H x W x D)	2 RU x 19" x 435 mm	2 RU x 19" x 435 mm	2 RU x 19" x 530 mm	2 RU x 19" x 353 mm
Weight kg	10.6	10.6	19	8
Weight lb	23.4	23.4	42	17.6

Performance requirements | The d&b ArrayCalc simulation software **Planning and simulation** External simulation software | The d&b Remote control solutions **Operation** Third-party integration | The d&b amplifiers **Processing and distribution** The d&b Network audio solutions | The d&b loudspeakers **Reproduction**

50   d&b Integration and interoperablity

d&b Integration and interoperablity   51

Processing and distribution.
The DS10 and DS20 Audio network bridges.

The DS10 and DS20 Audio network bridges

The d&b Audio network bridges interface between audio transport networks and AES3 digital audio signals while also providing distribution of Ethernet control data. The DS10 supports Dante networks, while the DS20 is used for the open standards-based Milan protocol.

Positioned within the signal chain in front of the amplifiers, these 1 RU devices expand the d&b system approach in both mobile and installation environments. Using the DS10 and DS20 Audio network bridges, audio signals and remote-control data can be combined using a single Ethernet cable.

Both devices can extract up to 16 AES3 channels and feed 4 AES3 channels into their respective networks. The DS10 and DS20 Audio network bridges each incorporate an integrated 5-port switch, offering a primary and redundant network. The DS20 5-port switch is fully AVB enabled, while the DS10 offers special functions such as Multicast Filtering and VLAN modes.

DS10 Audio network bridge front view
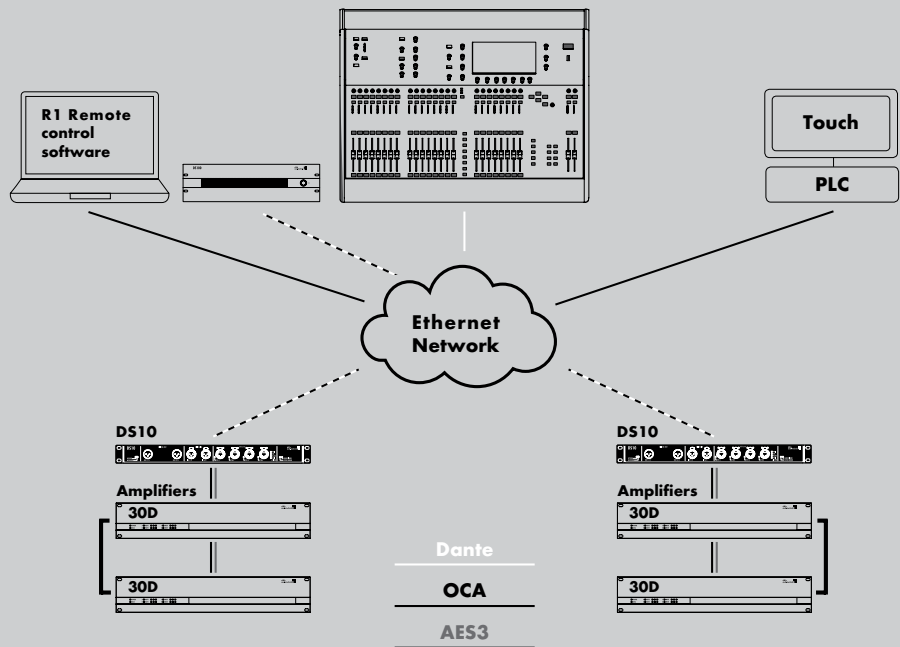

DS10 Audio network bridge rear view
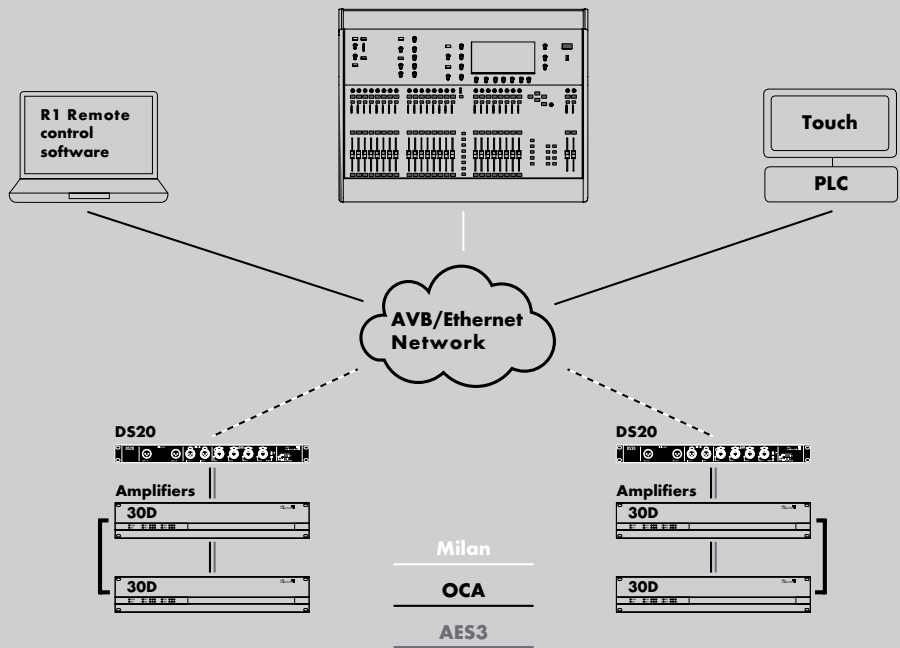

DS20 Audio network bridge front view

DS20 Audio network bridge rear view

Dante Audio network control diagram with audio and data

Milan Audio network control diagram with audio and data

| Performance requirements | The d&b ArrayCalc simulation software **Planning and simulation** External simulation software | The d&b Remote control solutions **Operation** Third-party integration | The d&b amplifiers **Processing and distribution** The d&b Network audio solutions | The d&b loudspeakers **Reproduction** |

Processing and distribution.

DS100 Signal Engine
The DS100 Signal Engine is the hardware on which Soundscape is built, as well as a network controlled and Dante enabled DSP platform that provides comprehensive signal management within the familiar d&b Workflow.

A versatile tool for use within complex audio systems, the DS100 can route and distribute multiple audio channels to numerous amplifiers driving loudspeaker positions and zones, and show relay and break out rooms. The networking capabilities of a network enabled processor are significant, particularly for busy, multi-room complexes. It comprises a 64 x 64 matrix, with delay and level control for all crosspoints and extensive signal processing at all inputs and outputs. These are integrated in the operating concept of the d&b R1 Remote control software, including grouping of parameters in remote views and storing of scenes in snapshots.

Advanced features within ArrayCalc and R1 simplify the integration of these matrix functions into a d&b system including configuring the DS10 Audio network bridge or preparing a Dante output patch to connect the loudspeakers. In addition, all matrix functions can be controlled remotely and automated via Open Sound Control (OSC). The DS100 is also the DSP platform at the core of d&b Soundscape, where the optional software modules En-Scene and En-Space provide dynamic object-based positioning and acoustic emulation functions.

DS100 Signal Engine

En-Scene Positioning View

En-Space Zone Master/Room Selector
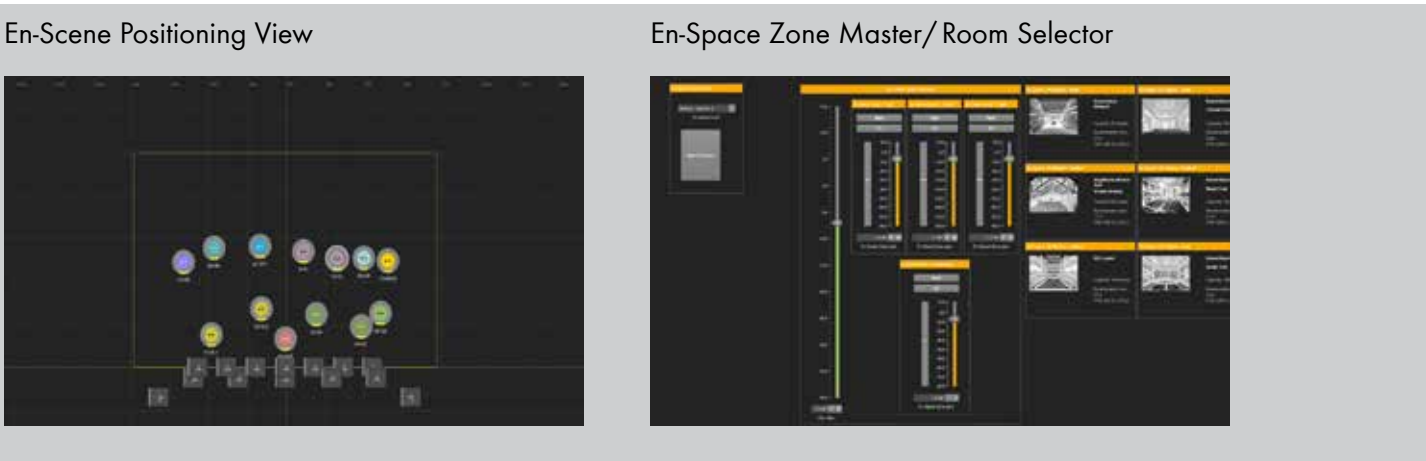
Enabling technologies.

ArrayProcessing
The optional ArrayProcessing function within the ArrayCalc simulation software incorporates powerful filter algorithms that calculate and optimize the linearity of the frequency response over distance while seamlessly correcting for air absorption to achieve a consistent tonal balance for each listener.

ArrayProcessing ensures that every member of the audience benefits from the same remarkable quality of sound by enhancing the spectral consistency, with a defined level distribution. The optimization intensifies the clarity and tonal balance of the high-performance d&b array solutions, taking existing d&b systems to dizzying heights. ArrayProcessing also applies a target frequency response to different loudspeaker arrays, giving each array the same sonic character and coherence, regardless of series, array length and splay settings.

ArrayProcessing
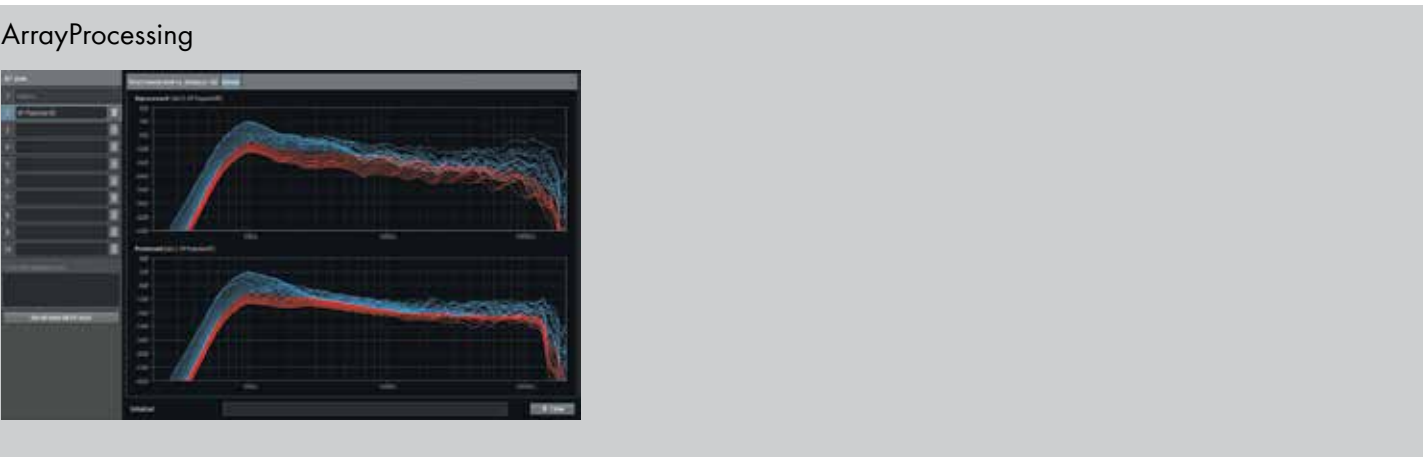
NoizCalc
The d&b NoizCalc software uses data from the ArrayCalc simulation software to predict the noise in the environment from one or more d&b loudspeaker systems by calculating the sound propagation according to the internationally accepted ISO 9613-2 and Nord2000 standards. With these tools, the optimal sonic experience is delivered reliably and faithfully to the right ears, and not the wrong ones.

The results are displayed as a grid noise map on the 3D terrain showing the calculated noise levels from the stage into the surrounding areas beyond the venue. This visual representation enables users to keep an eye on the noise immissions while planning PAs for events.

NoizCalc

Connectivity.
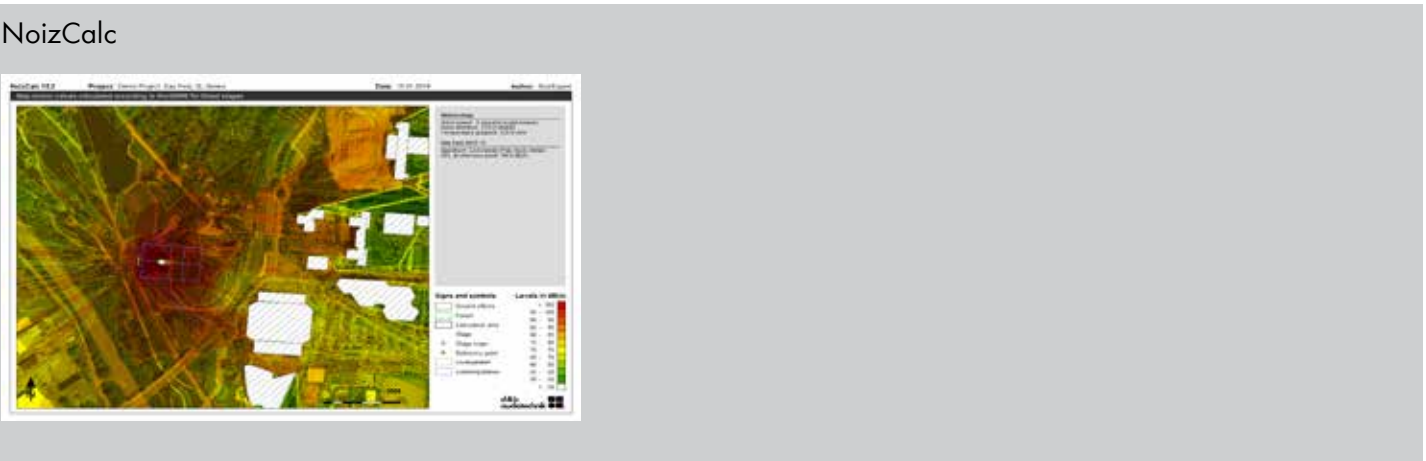
Integration with lighting, video, AV, building automation systems and other third-party devices is fundamental for an audio solution within an installation. d&b offers several technologies, based on several protocols plus standard GPIO connectivity.

OCA/AES70

The industry-standard control protocol Open Control Architecture (OCA/AES70) allows the entire d&b system to be integrated in control tools familiar to the end-user, system designer, and integrator, with maximum efficiency and no compromise.

Due to the open-source nature of AES70, third-party manufacturers are free to implement the protocol in their own products as they see fit. d&b has developed numerous AES70 plug-ins designed to help integrate the d&b Workflow seamlessly in control system architectures. To-date these include: QSC Q-SYS™, Peavey MediaMatrix®, Crestron®, AMX®, and Beckhoff.

AES70 uses standard IP infrastructure, including Ethernet and 802.11 Wi-Fi networks, and can be used alongside the common audio transport protocols. The Speed, high bandwidth and flexibility ensure that all system information is accessible dynamically, and guarantees that system changes are made immediately.

CAN/R70

An alternative to AES70, CAN-Bus is a serial communication protocol. The reduced data rate of CAN-Bus means that it is preferable to use AES70. However it is possible to mix CAN-Bus and AES70 with the Ethernet to CAN-Bus interface: the R70.

GPIO

The d&b installation amplifiers incorporate separate Euroblock connectors for General Purpose Input/Output (GPIO) and a General Fault contact. The GPIO connector offers five pins providing additional digital-control lines which can be configured either as inputs or outputs. This allows the use of external devices to control and detect certain functionalities within the 10D and 30D amplifiers.

GPIO functions available

| Input (Operation)	Output (Status Monitoring)
▪ Power on ▪ Channel mute (Mute Ch A ...Ch D) ▪ Mute all ▪ AmpPresets 1 – 12 ▪ Input Fallback/Input Override	▪ Input monitoring ▪ Load monitoring ▪ Power OK ▪ Mains Voltage OK ▪ Channel error (Ch A...D Error) ▪ Channel protection (Ch A...D Protection)

AES67

AES67 is an audio network interoperability standard which allows different audio network protocols to interchange audio with each other via Ethernet. Protocols that are interconnectable with AES67 include RAVENNA, Livewire, Q-LAN, and Dante.
The DS100 Signal Engine is AES67 enabled, while also offering native Dante support.

Example set-up
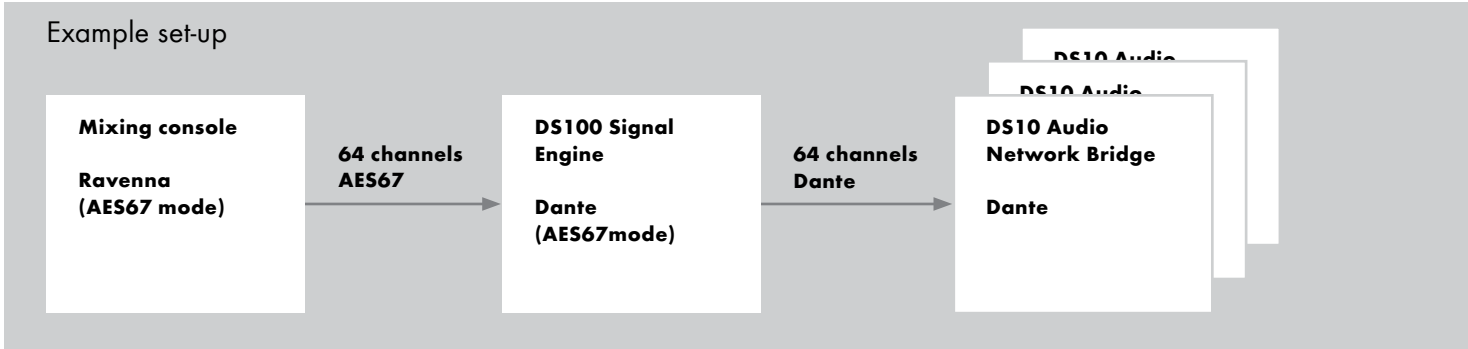
OSC

The DS100 Signal Engine can be controlled by third-party devices via the OSC (Open Sound Control) protocol. Almost all parameters, such as gain, delay, polarity and the matrix settings are available via OSC, as well as the Soundscape parameters of EnScene and EnSpace. So extensive integration via show-control systems, DAW software, tracking systems, or direct parameter control from the mixing console of the sound system is possible.
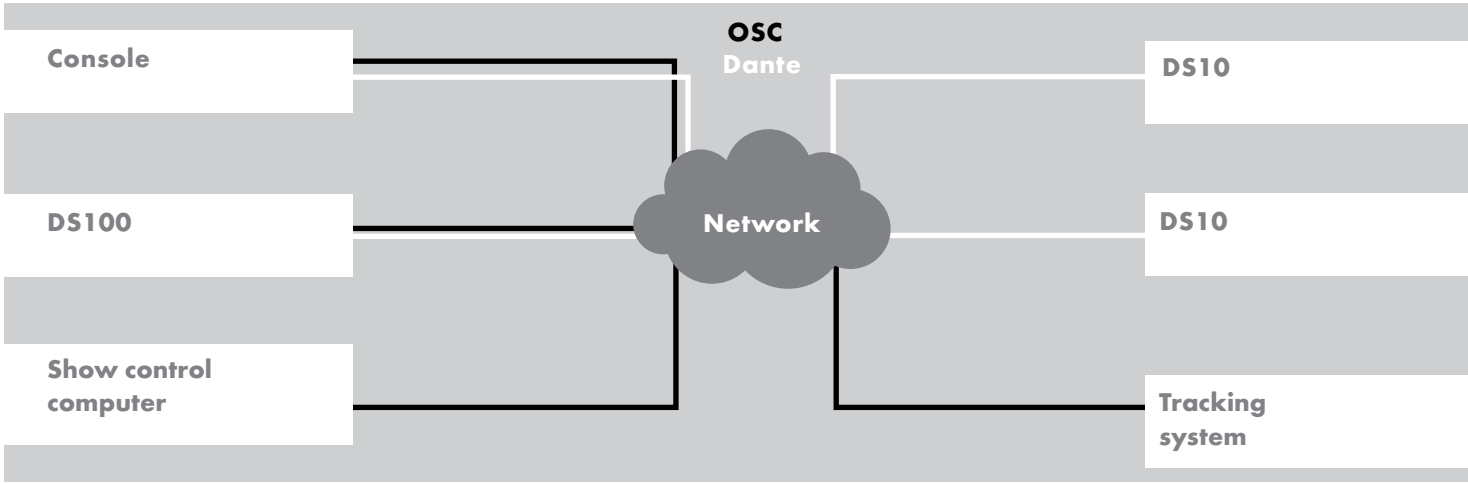
The DS100 OSC protocol specification can be downloaded from www.dbaudio.com.