



# CASE STUDY

Northland, A Church Distributed  
Longwood, Florida



# Constellation

## Constellation at Northland, A Church Distributed

Constellation electroacoustic architecture, part of Meyer Sound's line of digital audio products, marks a breakthrough in acoustical design for contemporary houses of worship. At the touch of a button, Constellation can tailor the acoustical characteristics of a room to achieve the optimal response for spoken word or any kind of music. This extraordinary flexibility, combined with natural sound quality and a lower cost compared to most physical or mechanical alternatives, makes Constellation the preferable option for churches with a variety of worship styles, as well as those hosting concerts featuring a diversity of traditional and contemporary concert artists. At Northland, Constellation also encourages participation through subtle but effective acoustical enhancement of congregational singing.



## SUMMARY

### Audio Environments for a Bold New Vision

The main campus of Northland, A Church Distributed is situated among the lake-dotted neighborhoods of Longwood, Florida, about 20 miles from downtown Orlando. However, as the church's name implies, Northland extends beyond one building in one place. Inspired by the vision of Dr. Joel Hunter, the church's senior pastor, Northland has pioneered the "networked church"—a visionary concept wherein new media technologies connect churches near and far to enable, in his words, "sharing people and resources, experiencing common worship services that link up different states, even different continents."

Under Dr. Hunter's leadership, Northland has realized both global reach (interactive "concurrent worship" services have linked Northland with churches as distant as Egypt and Ukraine) as well as burgeoning growth at home. The church multiplied its ministries by establishing satellite campuses in nearby communities, linking its four sites with high-speed digital connections. The original Longwood location, a converted roller rink, had been expanded nearly a decade ago to hold 1,200 worshippers; however, even with five worship services each weekend, growing attendance was overflowing the sanctuary. To accommodate current needs and future growth, in 2007 Northland opened a new main campus sanctuary building to serve as the spiritual and technological hub of its far-reaching ministries.

The leadership at Northland established ambitious goals for the new facility and its technology infrastructure. First, the building's acoustics and sound system would have to support an exceptionally broad range of worship music styles, ranging from an acoustic soloist to high-energy rock, and from a bluegrass quartet to a full orchestra with mass choir. Outside of



worship services, the room had to double as a versatile performing arts center for the wider community, hosting not only touring Christian rock artists but also symphony concerts, ballet performances, and children’s events. Also, the church leadership wanted the new sanctuary to preserve the sense of a close-knit community, despite holding nearly three times as many people as the previous space.

These goals are reflected in the design of audio systems at Northland. The main reinforcement system is based around Meyer Sound’s powerful and extremely accurate MILO line array loudspeakers, and it affords ample power reserves for effortless reproduction of even the most cutting-edge, youth-oriented Christian artists. At the same time, it carries the spoken word with extraordinary clarity, carrying even the most subtle inflections of the spoken word throughout the expansive auditorium.

In addition, Northland’s new sanctuary marks the first installation of Meyer Sound’s Constellation electroacoustic architecture in a house of worship. With Constellation turned off, the room’s relatively dry natural acoustics support high-level contemporary music. Then, with a push of a touchscreen button, Northland’s audio engineers can select one of three other acoustical characteristics, with reverberation times ideally suited to various acoustic music styles. Constellation also enhances congregational singing, encouraging participation and interaction. In addition, with flexible access to dozens of self-powered loudspeakers distributed around the room, Constellation provides Northland’s sound designers with a powerful tool for sonic creativity in a worship setting.

## Challenges

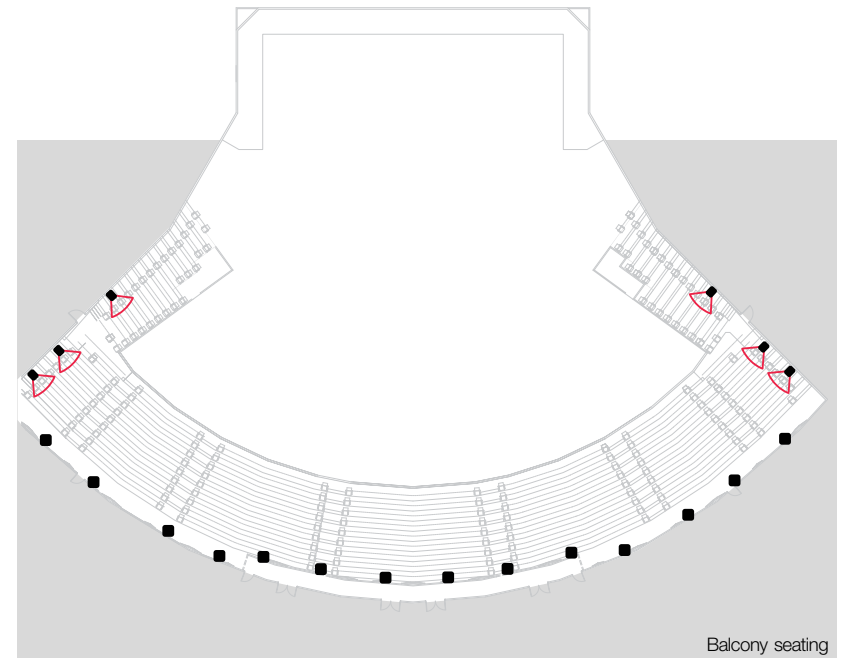
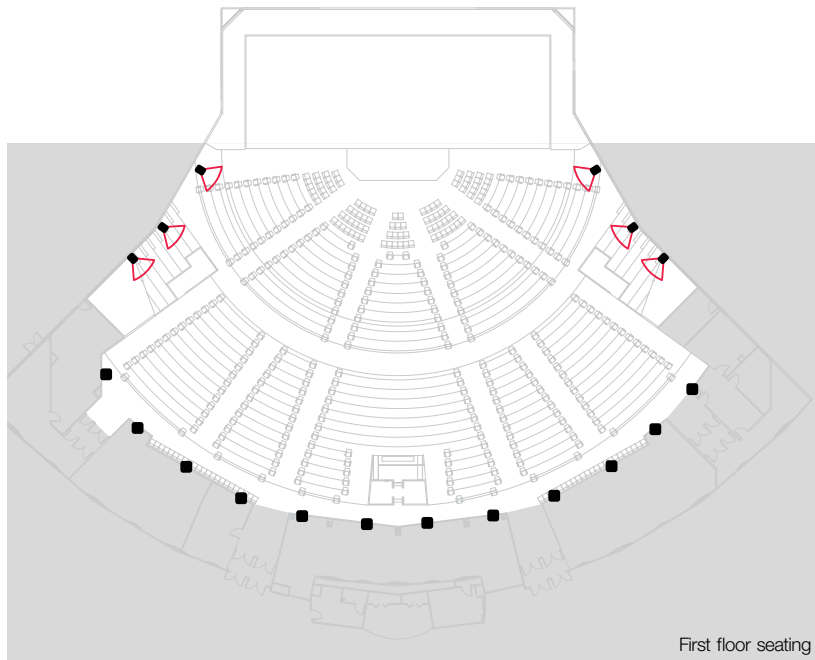
- A variety of amplified and acoustic worship music styles
- Very large room seating 3,300
- Congregation accustomed to the “feel” of a smaller space
- Active congregational participation a critical part of worship

## Requirements

- Provide high intelligibility for sermons, prayers, and other spoken word elements
- Afford maximum clarity for musical performances
- Subtly enhance congregational sound, singing in particular
- Enable instant change of acoustical characteristics
- Allow Constellation loudspeakers to double as surround sound/effects system

## Benefits

- Room acoustics can be changed with the push of a button, tailoring the reverberation characteristics for clarity, envelopment, intimacy, or warmth.
- Acoustics can be optimized for any music style, changing even within the same service
- Subtle enhancement of congregational singing encourages participation
- Constellation loudspeakers over the stage improve interaction among musicians to foster better performances
- Lateral and overhead loudspeakers also serve as a surround sound/effects system



The Constellation system employs a large number of microphones and loudspeakers, the placement and tuning of which are complex and critical. These figures show the loudspeakers deployed in Northland's auditorium. The system is carefully calibrated to ensure optimal energy levels emanating from every direction.

*“It gives me a level of environmental control that I’ve never had before. It’s a creative tool that will offer a lot of potential for years to come. It’ll be exciting as we dive into it even more.”*

**Todd Herrbach**  
Senior Audio Engineer

## CONSTELLATION SYSTEM OVERVIEW

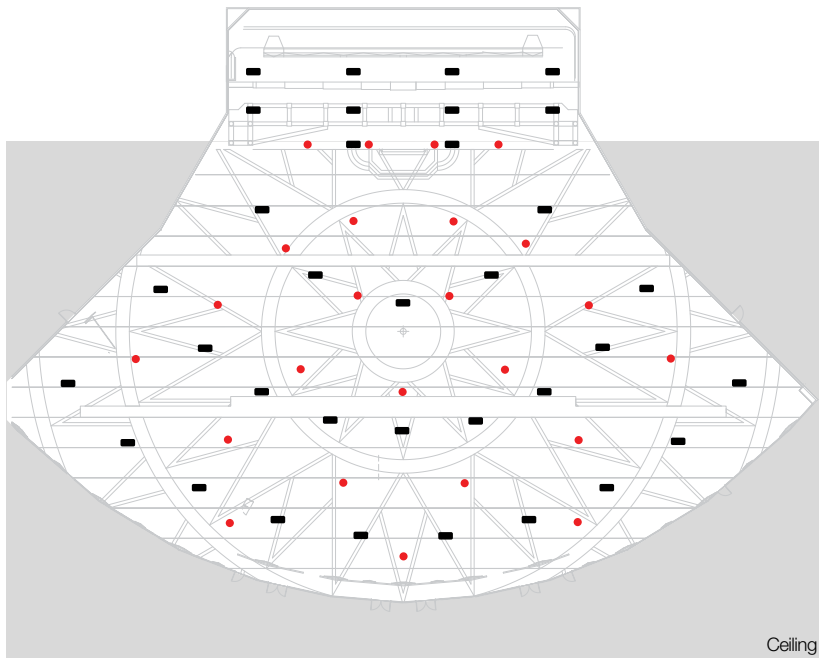
Constellation electroacoustic architecture combines advanced digital processing and transducer technologies with decades of research into the acoustical attributes of exceptional listening spaces. Because all acoustical characteristics are configured in the digital domain, Constellation yields a level of flexibility unattainable with traditional mechanical methods of variable acoustics, such as movable walls, drapes, temporary orchestra shells, or secondary chambers. Reconfiguration is accomplished at the push of a button, with no time constraints or labor costs.

At Northland, A Church Distributed, Constellation enables the staff to customize the natural-sounding acoustics to suit many styles of worship and a variety of special events. In addition, Constellation has a hardware infrastructure of multizoned, self-powered loudspeakers that allows the system to accommodate sophisticated surround sound and effects applications.

### System Design Goals

From the earliest phases of the building project, the Northland leadership team worked closely with noted AV systems consultant Bill Platt, principal of the Platt Design Group in Sierra Madre, California. The envisioning process outlined the following goals:

- Ensure very high intelligibility for the spoken word, coupled with ample power for a variety of amplified musical presentations
- Provide suitable acoustics for orchestras, choral groups, as well as unamplified ensembles or soloists



Constellation System Configuration

- Microphone
- MM-4
- ▭ UPM-1P
- 🔊 UPJ-1P

*“It’s a mystery as to why the ear–brain mechanism is so powerful. You really can’t quantify it. But with Constellation, the possibilities of tapping into that mystery are extraordinary. We are seeing an increasingly dynamic role for Constellation in all of our services.”*

**Tim Tracey**  
Executive Director of Worship

- Encourage active participation by the congregation, including singing, by providing the feel of an intimate enclosed space
- Facilitate the creative use of advanced—and even adventurous—sound design techniques in a worship setting

Early on in the discussions, it became apparent that fully implementing the first goal threatened to compromise the second and third goals. In a room of this size, a relatively dry acoustical characteristic was important to assure high speech intelligibility and to avoid the harsh, jumbled sounds that can result from amplified contemporary music in an overly reverberant environment. For the first goal, Platt recommended a fixed physical midband reverberation time of under 1.5 seconds.

Unfortunately, this dry room sound does not work well for most acoustical music presentations, as it robs them of “depth” and “air.” Simply adding reverberation to the PA mix does not resolve the problem, because the added reverberation stays inside the directional sound from the front; it is not being generated within the room to fully envelop the audience from all directions, as would be the case in a naturally reverberant orchestra hall.

Active congregational participation is similarly hampered by dry acoustics. Congregational singing is discouraged when each congregant seems to be singing alone and not as part of the whole group.

To avoid any compromise on these primary goals, Platt urged Northland to implement Constellation electroacoustic architecture as an integral part of the audio system design.

## Meyer Sound Solution

- 26 MM-4 loudspeakers
- 32 UPM-1P loudspeakers
- 12 UPJ-1P loudspeakers
- 24 Omnidirectional Constellation microphones
- 1 MS-Constellation processor with VRAS
- 3 MS-VRAS processors



## Project Participants

### Facility Owner

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www.northlandchurch.net

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www.plattdesigngroup.com

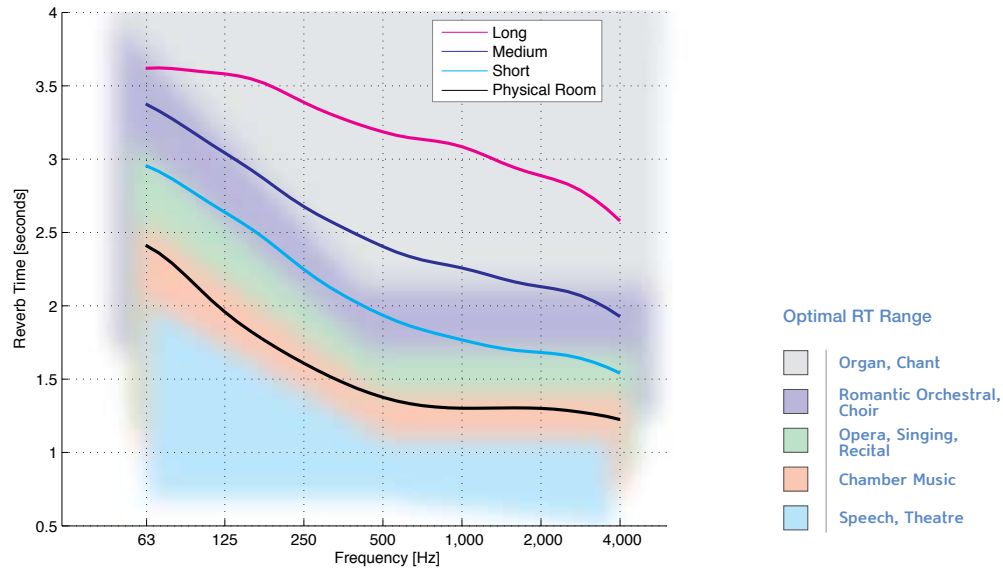
### Main Reinforcement System: Final Configuration and Tuning

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(314) 651-8021  
www.bobmccarthy.com

### Audio and Video Systems: Installations

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Orlando, FL 32811  
(407) 839-1154  
www.electrosonic.com

## RT Settings



Constellation tailors room response in terms of both reverberation time and the frequency content of the reverberant field. As a result, the acoustical signature of the room can be optimized for the needs of each type of performance or event.

## Constellation System Configuration

To avoid any semblance of “artificial reverberation,” every Constellation installation is custom designed to blend seamlessly with the innate physical acoustics of the room. Accordingly, the system must be precisely tailored to the size, shape, surface dimensions, and materials of the intended venue. Because the sanctuary at Northland, A Church Distributed was new construction, the intended use of Constellation was factored into the design of the physical acoustics. In particular, room design and material treatments limited the inherent room reverberation time to about 1.3 seconds in the midband (average at 500 Hz and 1 kHz), which is considered relatively dry for a room of this volume.

### Constellation Zones

At Northland, the Constellation system is laid out in four discrete zones: front, overhead, and mirror-image left and right. Each zone has its own Constellation VRAS (Variable Room Acoustic System) processor plus a dedicated group of input microphones and its own complement of Meyer Sound loudspeakers. Separate zones are essential for realizing natural reverberation, as the acoustical characteristics will vary with distance from the stage. The zone equipment configurations at Northland are:

**Front:** Ten overhead loudspeakers (UPM-1P), four lateral loudspeakers (UPJ-1P); six microphones

**Left and Right (each):** Eight rear loudspeakers (MM-4), six overhead loudspeakers (UPM-1P), four lateral loudspeakers (UPJ-1P); six microphones

**Center:** Ten overhead loudspeakers (UPM-1P); six microphones

## Constellation Settings

For the purposes of electroacoustic architecture, the Constellation system at Northland has three settings plus Off, allowing the selection of four acoustical room characteristics:

**Off:** With a midband reverberation time (RT) of about 1.3 seconds, the inherent room acoustics work well for high-level amplified music, particularly with fast tempos and percussive attacks. Off is also optimum for speech intelligibility.

**Short:** With a midband RT of 1.7 seconds, the Short setting gives the room a more intimate, enclosed feel. It yields optimum results for various types of chamber groups and small ensemble instrumentalists. Also, Northland engineers have found this setting works well for the sermon; although not optimum for speech, the extraordinary clarity of the main PA system maintains excellent intelligibility while Constellation lends the pastor's voice an "out in the room" presence.

**Medium:** With a midband RT of 2.2 seconds, this setting is optimized for solo singers and instrumentalists, whether in worship, recitals or operatic performances.

**Long:** With a midband RT of 3.0 seconds, this setting works well for romantic orchestral works and large choirs. It also provides the simulation of a large reverberant space to complement electronically sampled pipe organ sounds, when desired, as Northland does not have a physical pipe organ.

Note that Constellation at Northland also offers a Very Long setting. This is not shown in the reverberation time graph as it is not intended for use as natural electroacoustic enhancement. Rather, it is an extreme setting designed solely for use as a special effect—a cavernous sound that would not be realistic in the given space.

## Frequency Balance

Natural-sounding room reverberation requires balanced response across nearly all of the audible frequency range, including bass frequencies. Note that in the reverberation graph, the shape of the Constellation-enhanced curves closely emulates the room's physical reverberation characteristic, even in the lower frequencies. At Northland, these mid-bass frequencies are supplied by the larger two of the three loudspeaker types: the UPM-1P loudspeaker and the UPJ-1P VariO loudspeaker. (Use of larger loudspeakers was required because of the extreme width and volume of the room; in smaller halls, a Constellation system will normally employ smaller loudspeakers with bass augmented by compact subwoofers.)

## Special Effects and SpaceMap

When used in the "pure" application as electroacoustic architecture, the Constellation loudspeakers throughout the room receive input only from the Constellation microphones which are spaced throughout the room to provide natural regenerative enhancement of the physical room acoustics. However, these same loudspeakers can be accessed for use as a surround sound or special effects system. At Northland, the system is configured to allow the main mixing console to supply an auxiliary send separately to each of the four Constellation zones. In addition, the Constellation system incorporates the powerful SpaceMap software program, which allows one or more sound sources to be routed separately to any one of the discrete outputs of the Constellation system. SpaceMap allows preprogrammed dynamic panning of sounds to and from any output, enabling the sound designer to freely move sounds anywhere within the space of the room.

## User Interface

Constellation is controlled from the front-of-house mix position via a simple web page interface that is provided by the Constellation primary processor. Five reverberation time settings, five system gain settings, and the ability to mute and unmute the stage microphones can be controlled independently. This provides flexibility for use with both acoustic and reinforced events.

## Primary Sound Reinforcement Systems

The main sound reinforcement system utilizes a total of 36 Meyer Sound self-powered loudspeakers to provide highly intelligible, uniform coverage throughout all auditorium seating areas. The full bandwidth response, along with extraordinary headroom reserves, makes the system fully suitable for any type of contemporary or traditional musical performance. The system is anchored by MILO line array loudspeakers, which are accepted on the riders of nearly all major touring artists in the world, Christian or secular.

- 16 MILO line array loudspeakers
- 2 CQ-1 loud speakers
- 2 CQ-2 loudspeakers
- 6 UPJ-1P VariO loudspeakers
- 4 UPM-1P loudspeakers
- 6 M3D-Sub directional subwoofers

# Constellation

*“Before the concert, I thought that the room could sound good with classical music as well as with amplified acts, but I had no idea it would sound that brilliant. It was the first time, but certainly will not be the last, that we will use Constellation in a way that will truly stun the audience.”*

## **Marc McMurrin**

Executive Director of Operations  
Northland, A Church Distributed



## **Installation, Calibration, and Tuning**

Prior to installation of any audio systems at Northland, the Meyer Sound Constellation team took precise measurements to determine the fixed acoustical parameters of the room. Using this characteristic as a foundation, the Constellation team then determined the numbers and precise placement for both loudspeakers and microphones. Since Constellation features both regenerative and in-line components, system design, especially component placement, is complex and critical. However, actual installation of the system requires only best-practice professional installation skills and attention to detail in conforming to the design. No special tools or proprietary techniques are involved.

Once the installation of fixed components was complete, the Meyer Sound Constellation team returned to calibrate and tune the system, as well as generate the presets. As with the design of a Constellation system, the calibration and tuning stage involves complex procedures requiring highly trained and experienced staff. The Constellation team conducted these processes using proprietary methods and powerful tools, including Meyer Sound’s own SIM 3 audio analyzer. At the conclusion of the tuning process, standard measurements, replicable by any acoustical professional, were taken to confirm that the stated design goals had been achieved.

## **The Outcome**

### **A Foundational Sound**

After the sanctuary was first opened in August 2007, the audio staff immediately began an exhaustive experimentation and review process to determine how best to apply the power of Constellation to the varied programming heard at Northland, both during worship and at special events. After several months of careful listening and in-house consultation, a consensus emerged that the Short setting of Constellation would serve as the base sound of the room, as it provides the degree of “aural interconnectedness” desired for the sense of a close-knit group in a common space. Constellation is only turned completely off when necessary for very high energy, up-tempo amplified music.

Audio Director Steve Groves says, “The clarity of the main PA is so good that adding in Constellation doesn’t impair intelligibility. It just gives a better feel to the room.”

### **Adapting to Any Musical Style**

Though interwoven with a common spiritual thread, the musical styles heard at Northland are astonishingly diverse. A single worship service can move effortlessly between folk, classical, soul/R & B, rock, and various ethnic-influenced styles. With Constellation, each can receive the optimum acoustical setting—with changes sometimes accomplished between successive songs.

Steve Groves relates a typical example. “A couple weeks ago, we started out with an up-tempo praise song, then went into an a capella arrangement of “Amazing Grace”, and after that straight into another up-tempo song. During “Amazing Grace,” I reached over to the touchscreen and put Constellation into the Long setting, to give it a larger, more traditional sound, and really let the congregation hear themselves,” he says. “When they hit the last note, I went back to the Short setting.”

Tim Tracey, Northland’s executive director of worship, recalls one memorable introduction to Constellation’s unique capability. “We were rehearsing a bluegrass gospel song, “Get Up John,” at first just through the main PA. Then we turned on Constellation, and it was amazing,” he says. “All of a sudden we had much more air in the acoustic instruments and vocals.”

### **The Core of Community Worship**

The use of Constellation has proven extraordinarily effective in promoting congregational participation by creating an unmistakable sense of aural involvement of the entire worshipping community.

“A congregation isn’t passive like the audience in a theater or a concert hall,” emphasizes Tim Tracey. “Worshippers play a vital, active role. We needed to create an environment that connects them to each other and encourages participation, and Constellation supports that through sound.”

### **Tools for Unlimited Creativity**

Northland is known for its passionate commitment to creativity, and Constellation’s technology infrastructure has given the church’s audio staff new possibilities for applying imaginative sound design to worship.

“The PA is mono, but with Constellation I can also use the top, side, rear, and front zones independently as the music calls for,” remarks Greg Weiss, audio engineer and sound designer. “I can move sounds around, envelop the audience, or come from behind or above. It can be a pad or synth bed, or maybe vocals wrapping around, or perhaps raining down like a waterfall from the ceiling. But it’s always subtle and tasteful, and fits the overall environment of what we are doing.”

Tim Tracey recalls one striking example: “We did one song where we turned the main PA off and mixed all the sound entirely in the Constellation system loudspeakers. It was a dissonant vocal called “Over Oceans,” and we wanted to illustrate the hidden harmony in what seems like dissonance,” he says. “The song was strong on its own, but Steve propelled it to a whole other level with the dynamic mix he did all around the room. It was one of the most effective things we’ve ever done in worship.”

## **About Northland, A Church Distributed**

Northland, A Church Distributed has been a pioneer in building a networked, multi-campus church. With four central Florida locations and the total number of weekly worshippers of over 12,000, Northland decided to build a new 3,300-seat facility to accommodate the congregants, replacing the original space in Longwood that was previously converted from a roller rink. Known for leveraging digital AV technology to unite the worshippers in the different sanctuaries, Northland adopted the most advanced technologies in the new building to create a supportive environment for the worshippers.

# Constellation

*“I was frankly amazed at how well the [Constellation] system worked. What I found particularly impressive is how I could maintain a clear sense of the origination of different instruments at various places around the stage.”*

**Douglas Adams**  
President  
Dallas Symphony Orchestra



## **Constellation Makes Dallas Symphony Orchestra Feel At Home**

During an acclaimed concert of the Dallas Symphony Orchestra led by Guest Conductor and Violinist Pinchas Zukerman, Northland was successfully transformed into a concert hall, providing the optimal acoustical environment for the audience to revel in the musical masterpieces of Stravinsky and Schumann. With the physical characteristics of Northland’s room optimized for amplified music, the success of the Dallas Symphony concert is notable, and made an impression on Mark Melson, the symphony’s vice president of artistic operations.

“I was worried when I first walked into the building,” confesses Melson, after seeing the vast, wide room, “but my worries ended when the musicians started playing. The orchestra retained its natural warmth and presence at seats well out into the hall.”

The sound quality during the event was certainly appreciated by the audience—including Dallas Symphony President Douglas Adams. “I was frankly amazed at how well the [Constellation] system worked,” says Adams. “What I found particularly impressive is how I could maintain a clear sense of the origination of different instruments at various places around the stage. Each was perceived in its proper place, as it would be with natural acoustics.”

With the goal to provide a familiar acoustical environment for the performers onstage, Meyer Sound’s Constellation team created a customized setting of early decay time (EDT) and reverberation time (RT) that closely emulate measurements at



the Dallas Symphony's acoustically impeccable home, the Morton H. Meyerson Center. The resulting system had an RT of 2.4 seconds and an EDT of 1.9 seconds, very close to the Meyerson measurements of 2.6 seconds RT and 1.9 seconds EDT.

Using only Constellation without reinforcement from the main PA system, the Dallas Symphony orchestra was reported to be an "eye- and ear-opening" experience for the church. "Before the concert, I thought that the room could sound good with classical music as well as with amplified acts, but I had no idea it would sound that brilliant," says Marc McMurrin, executive director of operations at Northland. "It was the first time, but certainly will not be the last, that we will use Constellation in a way that will truly stun the audience."

Tim Tracey, Northland's executive director of worship, adds that the success of the symphony event has renewed the church's vision to serve the community with expanded offerings. "Since the Dallas event, our phone has been ringing off the hook with groups interested in using our facility, and our new task is to determine how to best use this space, in keeping with our congregation's mission." One of Northland's plans is to arrange opportunities for nurturing young local musicians, including potential collaborations with a youth orchestra.

## A Multipurpose Venue for the Community

The Constellation system has helped position Northland as a viable alternative performance space as it attracts world-renowned artists, and has allowed the sanctuary to reach out to the local community. Artists who have performed at Northland include Florida Youth Symphony Orchestra, the Kiev Symphony Orchestra and Chorus, country star Wynonna, gospel music singer Kirk Franklin, and contemporary Christian artist Michael W. Smith.

"Our senior pastor, Joel Hunter, refers to our new building as 'a communication device with a sanctuary attached,'" says Marc McMurrin, Northland's executive director of operations. "Having the technology to present symphonic music gives us a great tool for communication, one that helps us in our mission to serve the whole community."

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