NYQUIST ™

The Modern Educator's Digital Communication Solution

Nyquist is a software-based state-of-the-art IP paging and intercom solution that leverages the latest digital, mobile and software technologies to address today's educational environments, security challenges and mobile lifestyles. But to call it a paging and intercom system is to under represent its capabilities in communication, safety and security. Nyquist is a suite of powerful, yet easy to use tools that allows educators to quickly and effectively manage campus and district-wide communications.

The heart of Nyquist is a remarkably easy to use software suite with an intuitive Graphical User Interface (GUI). Nyquist software resides on a network server and utilizes existing LAN/WAN and/or legacy 'home-run' cable infrastructure for two-way data and communication flow. IP phones and purpose-built Nyquist appliances provide convenient communication control and interoperability with third party devices.
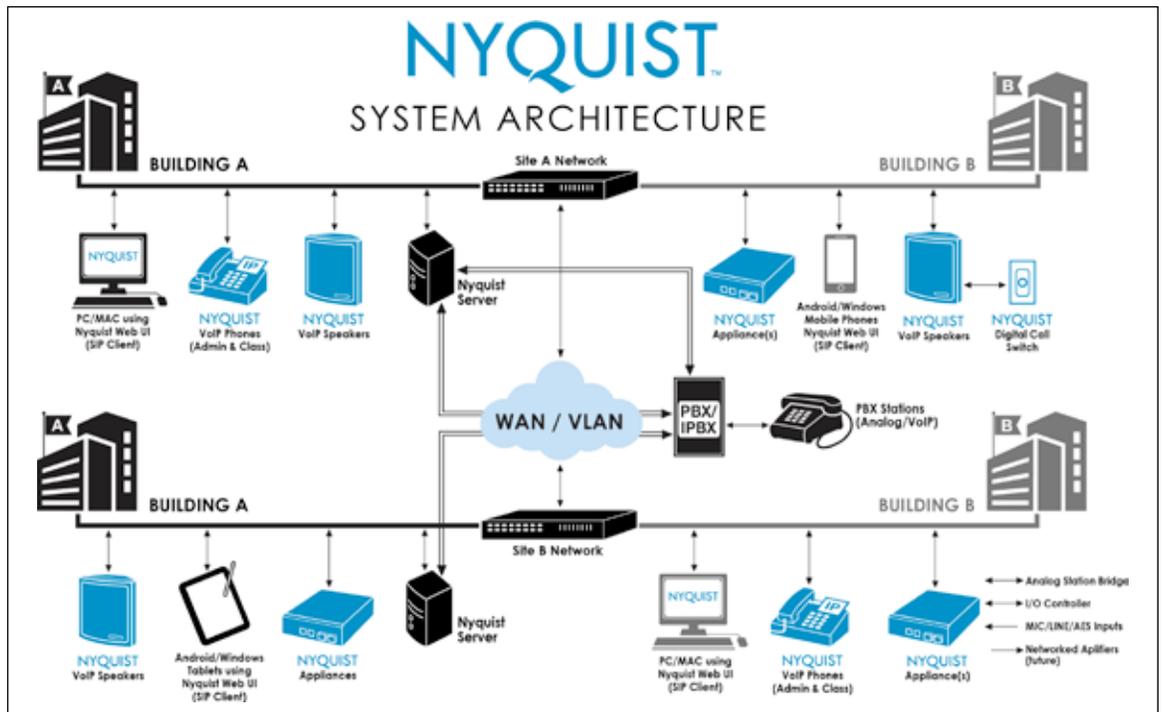
Nyquist Highlights
- Easy to install, expand and use
- Accessible – administrators, technicians and other key users can access the system on web-enabled devices – desktop or mobile
- Compatible with legacy intercom infrastructure, including re-use of existing analog speakers, call switches and cabling (with use of the Nyquist Analog Station Bridge appliance)
- SIP device and trunk support (IP-PBX, VoIP phones, and VoIP speakers)
- Audio feature rich
     - Songs / Playlists
     - Call monitoring and recording capability
     - Live and/or pre-recorded announcements
     - Networked audio distribution
- Available integrations with PBXs, security systems, relay control, time systems and third-party PA systems
- Creating and managing multiple bell schedules is simple and intuitive
- Flexible – easily add features, stations and facilities with virtually unlimited scalability*

Why Software?

Traditional intercom systems are mostly or entirely hardware based. It may seem odd at first to replace the vast bulk of hardware with a software solution, but it makes perfect sense. While hardware is difficult if not impossible to adapt to changing needs and conditions, software is adaptable and accessible. Nyquist allows administrators and technicians to shape the system to perfectly meet their unique needs, rather than to be constrained by rigid hardware limitations.

Nyquist can be integrated with existing analog cabling as well as IP-only networks

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Unlimited Scalability

Nyquist's software can expand as the user's needs expand. The system can accommodate an infinite number of stations and facilities.*

Easy and Economical to Install

Nyquist integrates with the facility's existing cabling. Additionally, the use of an Analog Station Bridge appliance allows customers to leverage existing analog speakers and call switches. Many Nyquist endpoint appliances are PoE devices. With Nyquist there are no bulky racks to build, simply install the Nyquist server software then plug in the endpoint devices and Nyquist appliances. All Nyquist appliances are auto discovered by the server to facilitate fast and easy system set up.
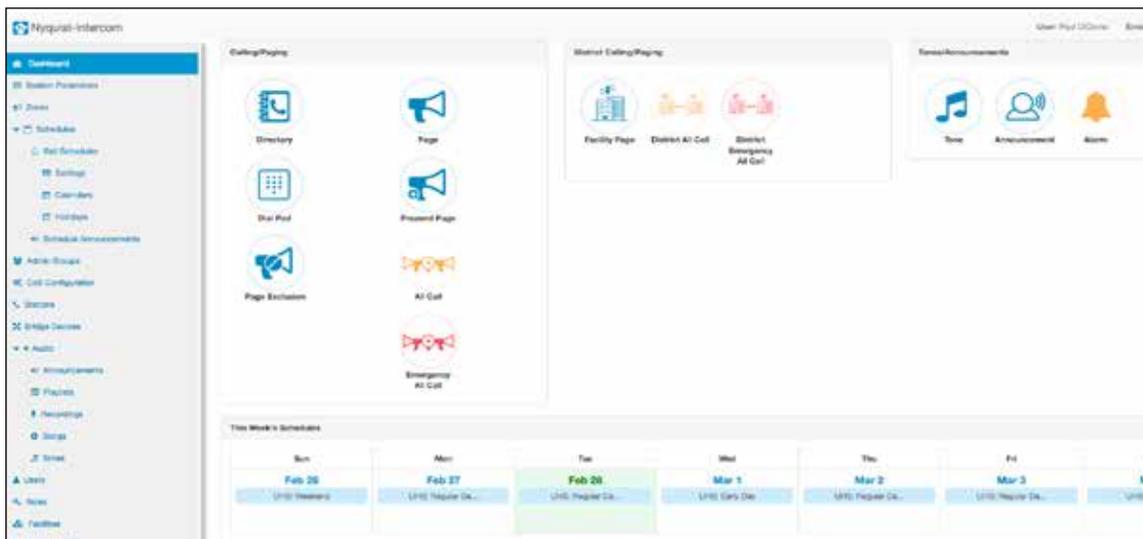
Easy Graphical User Interface (GUI)

Administrators, educators, and support staff are going to love Nyquist! Users interface with Nyquist either through a Nyquist-certified VoIP admin phone or via a browser-based GUI (Fig.1) on PCs, smart phones and tablets**, allowing users to access the system no matter where they are in the connected world.

The core principle of Nyquist's user interface is simplicity. Its functions and design are shaped by the needs of the user to reduce distractions and improve operator response time and accuracy. Form follows function, resulting in an interface that is functional, intuitive, and aesthetically pleasing.

Nyquist's GUI allows people with a broad spectrum of technical proficiencies and experience levels to use the system. Large and clear buttons, along with simple and clear text makes Nyquist easy to use even on touch-screen and mobile

Figure 1 - The main Dashboard of Nyquist's Graphical User Interface

devices. Embedded tooltips and guides aid in user self-sufficiency. Technical administrators can assign individual users permissions appropriate only to their role and proficiency (Fig.2).

When supported by the facility's infrastructure.
*** With iOS devices the Dashboard does not function, but all other features are accessible via the menu.*

NYQUIST CAPABILITIES

Unlimited Scheduling

Administrators can take full control of scheduling functions via Nyquist's powerful web based user interface. Feature highlights include:

- Unlimited Time Zones
- Unlimited number of Holiday schedules, allowing bells and tones to be suspended/silenced when school is not in session
- Unlimited bell schedules
- Daylight Savings Time auto-adjust
- Daily, weekly and monthly calendar views
- Create or upload an unlimited number of custom bell tones (standard tones supplied)
- Select and manage class change music

Figure 2 - Nyquist makes it easy to define roles and permissions

Unmatched Audio Capability

Bogen's 85-year history of audio excellence is evident in the range and quality of audio features in Nyquist such as:

- High fidelity audio quality for clear, concise communication and pleasurable music playback
- Pre-record and store unlimited announcement files
- Control audio via administrator phone or Web UI
- Upload and manage WAV and MP3 audio files
- GUI based program (i.e., audio) distribution
- Create playlists with easy title drag-n-drop capability
- Music Library with meta data (e.g., title, artist, album, track, length, genre, year)
- Music import and management
- Distribute audio to specific zones and/or stations
-

State-of-the-Art IP Paging and Intercom

Bogen did not forget the basic needs of educational institution communications – paging and intercom. Those basic functions are brought to new levels of sophistication and control with Nyquist.

- Unlimited station capacity
- District-wide All Call (pages every speaker in the District)
- All Call, Emergency All Call and Zone Paging
- Unlimited paging zones
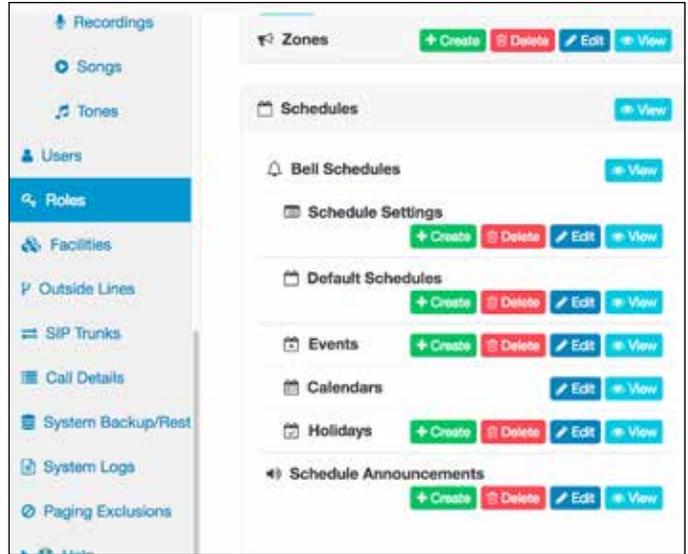- Record page for immediate playback on hang up

Figure 3 - Nyquist allows administrators to easily create, edit and review bell and march to music schedules
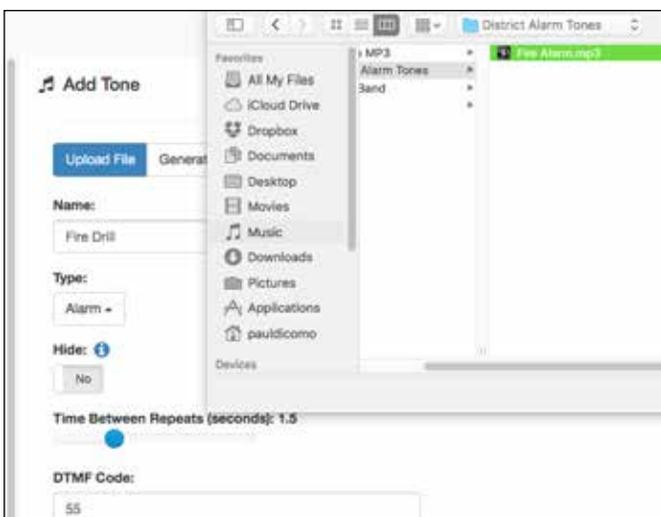
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Figure 4 - See the school calendar at a glance in Nyquist 's browser User Interface

- Unlimited multiple simultaneous paging calls
- Executive override to access intercom paths (Admin can override others and interrupt page)
- Direct call rooms from admin phone or Web UI
- Page exclusion for testing, meetings and other quiet zones
- Emergency call-in with special ring and alert
- Three call switch priorities (Normal, Urgent and Emergency)
- Audible Call Assurance confirms call placement

**Convenient and Powerful
Configuration and Maintenance**

Figure 5 - Creating and editing bell and alarm tones is simple and intuitive

IT and Facilities technicians can access Nyquist's web UI from any Chrome browser-equipped device including smart phones, PCs and tablets.* Wherever they are, technicians have the ability to program, diagnose and control.
Capabilities include:

- Server and system log file viewing and export
- Real-time visibility of system-wide IP device status
- System backup and restore
- Automated scheduled system backup
- System status displayed on Dashboard
- Server status monitoring via SNMP
- Unlimited user, role and permission definitions
- Software adjustable device and paging zone volume

With iOS devices the Dashboard does not function, but all other features are accessible via the menu.

- Automatic VoIP phone pro-visioning (Nyquist certified 3rd-party phones only)

Enhanced Security and Safety
In today's fast paced world, instantaneous accessibility to information and control are vital for the safety and security of students and staff. Nyquist can help with features such as:

- Call monitoring with Spy, Whisper and Barge modes
- Call recording and playback (911, Emergency, Normal)
- Emergency paging with pre-programmed messages (WAV, MP3) (e.g., "There is a Fire Emergency, please exit the building, this is not a drill.")
- E911 support to identify call origin location/building
- Security DISA call routing allows EOCs and civil authorities to monitor talkback equipped station audio
- Nyquist can interface with select third party security devices such as locks, alarm systems and sensors via the I/O Controller appliance.
- Contact closure input can place the system into page exclusion mode
- Contact closure input triggers external event (via relay driver output)
- Contact closure input triggers internal event (via program logic) such as initiating a pre-recorded emergency page
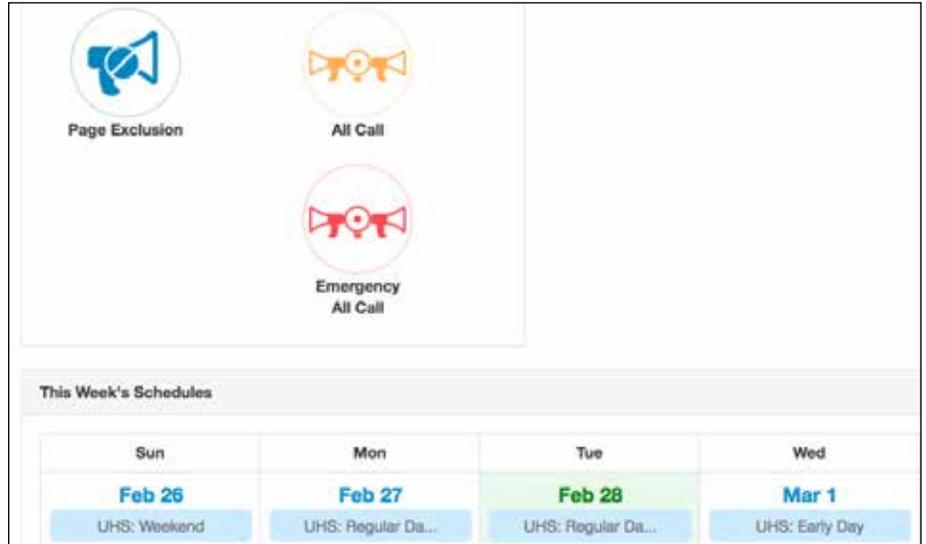

Figure 6 - Nyquist's admin dashboard is intuitive to use

Figure 7 - IT and facilities managers will appreciate Nyquist's maintenance tools

Telephony – Integrated and Elevated
Nyquist easily integrates with virtually any VoIP or analog phone system to create a seamless communication platform.
Capabilities include:

- SIP trunking and PBX analog FXO/FXS interface support
- VoIP phone support (select certified third party phones)
- VoIP phone or intercom capability for all stations
- Call Forwarding / Parking / Transfer
- Transfer calls to phones outside of the system
- Voice prompts guide users to the next step in call forwarding, parking and other phone functions
- Internal/External Caller ID
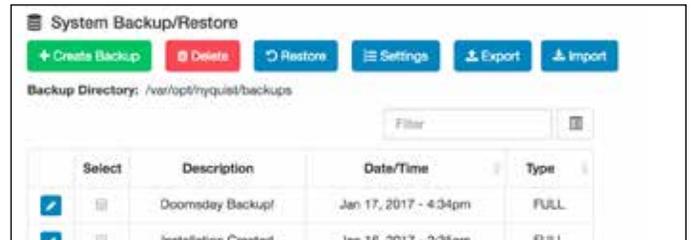- Display, manage and export call detail records

* Best results with Windows and Android devices using the Chrome browser. With iOS devices the Dashboard does not function, but all other features are accessible via the menu.

Figure 8 - Nyquist keeps a log of every call

- 911 Call Alerts: Notifications sent to Web UI dashboard and Admin phones, with option to monitor call 911 dial through allows any authorized station to direct dial 911
- Walking Class-of-Service enables administrators to use a PIN to access the full suite of Admin features from any facility phone
- Automatic time-of-day call routing (Day / Night Admin)
- Answer an incoming call from anywhere in the facility
- Assignable Voice Mail
- Voicemail message waiting indication light on Nyquist Admin and SIP phones supporting this functionality
- Unlimited Class-of-Service (COS) profiles
- Secure and unsecure Direct Inward Station Access (DISA) from outside the system

Figure 9 - With Nyquist, it's simple to add, configure and edit stations

NYQUIST

NYQUIST APPLIANCES

Analog Station Bridge (ASB)
NQ-E7030
The ASB makes it easy and cost-effective for customers with legacy paging and intercom systems to upgrade to Nyquist's rich feature set and incredible control. The ASB allows Nyquist to use the existing home run wiring infrastructure of Bogen Multicom and Quantum installations, as well as similar analog or hybrid paging/intercom systems. Each ASB supports up to 24 speakers and call switches, and 120W of embedded power is available to drive any combination of 25V speakers and horns.

Specifications
- 10/100 Ethernet
- 24 station interface
    - Supports connections to as many as 24 individual 25V speakers
- 24 dry contact closure-type analog Call Switch connections
- Half-duplex talkback using speaker as pickup
- CAN Bus 2.0 Interface for digital call switches and other accessory devices
- 120W embedded power supplies all 24 channels
- 2 x RGB 'full spectrum' LED status indicators
- USB 2.0 host port, type A connector (future use)
- Universal mains supply (100VAC – 240VAC)
- May be rack, wall or shelf mounted:
  17.5" W x 6.9" D x 1.7" H (2" with feet)

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Input/Output Controller
NQ-E7010

The I/O Controller appliance provides an interface to third-party security and communications systems such as locks, sensors and alarms. It enables the Nyquist platform to recognize 3rd party switch contact closures and provides external triggers to drive relays. Each I/O Controller appliance provides eight (8) separate I/O circuits to accept and/or trigger events.

Specifications
- 10/100 Ethernet
- PoE Class-3 (IEEE 802.3af compliant)
    - Optional 48VDC 15W power supply
- 8 x dry contact closure inputs
- 8 x relay driver outputs (500mA max. per ground sink)
- USB 2.0 host port, Type A connector (future use)
- May be wall or shelf mounted: 5.6" W x 5.4" D x 1.7" H (2" with feet)

Digital Call Switch
NQ-E7020

The Nyquist Digital Call Switch allows users to initiate a normal, urgent, or emergency call from classrooms or other staff locations via an associated Nyquist intercom speaker. This single-gang box type wall-mounted switch uses a full spectrum color LED lit ring to confirm user actions and to indicate status (for example, changing from solid color to blinking), or to acknowledge a button press when a user initiates a call or when a call has been terminated. The switch is a capacitive touch type with no moving parts to jam or fail.

Specifications
- CAN Bus 2.0 Interface
- Capacitive touch button
- RGB LED lit ring provides user feedback
- Software defined button behavior
- Up to 256 switches can be daisy chained for expanded functionality
- Single gang, low voltage installation
- Decora style plate

NYQUIST™

Matrix Mixer Pre-Amp
NQ-P0100

Expand the reach of the Nyquist system by adding the Matrix Mixer Pre-Amp appliance. It enables microphone, ASE3 digital and line-level source input connections to be integrated into the Nyquist system. Using Nyquist's GUI dashboard, the sources can be routed to any endpoint or group of endpoints on the network for paging, public address or program distribution. This appliance allows large-scale PA venues such as stadiums, gymnasiums and auditoriums to be fully integrated into the facility's paging/intercom system.

Specifications
- MIC/Line Inputs
    - CH1- CH4 configurable balanced/unbalanced inputs via 3 XLR and 4 screw-terminal connections
    - CH4 configurable to support Push-to-Talk Mic applications
    - CH1 can be configured as a digital AES/EBU (AES3) input
- Line Level Monitor Output
- Per Channel software configuration & control (via UI)
    - Set Master Volume / Mute / Gain / Attenuation / Mic Ducking
    - Define Input-to-Output matrixing
    - Per Channel Input MIC/Line Level Select
- USB 2.0 host port, Type-A connector (future use)
- 100V – 240V Universal AC Mains
- Wall or shelf mounted
- 8.1" W x 8.1" D x 1.7" H (2" with feet)

Nyquist VoIP Speakers
NQ-S1810CT (Ceiling)
NQ-S1810WT (Wall Baffle)

Nyquist VoIP ceiling and wall baffle speakers provide superior HD audio quality and seamless integration into the Nyquist ecosystem.

There is no need for external amplifiers, traditional intercom wiring or transformer taps to manually set or adjust. Simply connect them via Cat5 to a PoE Switch or PoE Injector and they are ready to operate. Volume is controlled via the Nyquist GUI Dashboard. As one would expect from Bogen, the HD audio quality is superb, with excellent incoming and outgoing intelligibility. Many two-way speakers use the speaker itself as the microphone, resulting in poor outgoing audio quality. The Nyquist VoIP speakers use a separate purpose-designed MEMS digital microphone to achieve their superior talkback audio.

Specifications
- 10/100 Ethernet connection
- PoE Class-3 - no local power required (IEEE 802.3af compliant)
- DHCP deployment for easy install
- Pre-assembled for faster installation
- 10W integrated power amp
- MEMS digital microphone for full duplex communication
- CAN Bus 2.0 Interface connects to Nyquist Digital Call Switches
  12.8" diameter X 3.5" H (ceiling)
- 9.2" W x 5.2" D x 10" H (wall baffle)

Administrative Display Phone
Bogen has certified various 3rd party phones for use as both Nyquist Administrative & Staff/Classroom applications. Bogen will ensure the correct operation of these certified phones – even as the vendor updates firmware, and functions.

The current list of certified phones includes:
- Yealink T48G (Admin) & T21P (Staff)
- Digium D65 (Admin) & D60 (Staff)

Nyquist Server
Nyquist software is intended to be installed on a server provided by the school system's IT department or the installing Bogen dealer. Ideally there would be one server in each facility, although multi-school campuses could use a single centrally located server.

Server Requirements
- OS - Debian Linux OS (AMD 64-bit version) release 8.4.0 or later
- CPU - Quad-core Intel-based processor running at 3.0 GHz or higher
- Memory - 8 GB RAM
- Disk Storage - One 250 GB disk drive (A RAID configuration is recommended for redundancy and high availability.)
- Network Interface Card (NIC) - 10 / 100 /1000 MB Ethernet port
- PCI Expansion Slots – Min. one PCI/PCIe slot if telephony network connectivity other than, or in addition to SIP trunking is needed.

Trust Experience – Trust Bogen

The roots of Bogen Communications, Inc. go back to 1932 - the dawn of the audio electronics age. In its storied 85 year history the company has pioneered dozens of technical advances in audio and communications. Bogen has been engineering paging and communications systems for educational institutions for over 50 years with systems installed in over 10,000 school system in the US and Canada.

When choosing your next communications system, put your trust in the time and field-tested experience of Bogen.

In Honor of Harry Nyquist

In searching for a name for the new software-based paging and intercom system, the Bogen research and development team chose to honor one of our heroes, Harry Nyquist. Nyquist was an award-winning Swedish/American Physicist and Electrical Engineer known as the father of Information Theory, Communication Theory and other fundamental underpinnings of today's Information Age. We strive every day to make our Nyquist paging and intercom system live up to Harry's legacy of improved communications for all.