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Research

Evaluation of Polycom's Noise Reduction Features

Hands-on testing of two innovative audio capabilities:
Polycom® Acoustic Fence™ and NoiseBlock™

This evaluation sponsored by ...

Polycom®

Background

Founded in 1990 and headquartered in San Jose, California, privately-held[1] Polycom Inc. develops, manufactures, and markets video, voice, and content collaboration and communication products and services. The company employs ~ 3,800 people, and reported top-line revenue of US $1.27B for its 2015 fiscal year.[2]

In Q4 2016, Polycom commissioned Wainhouse Research (WR) to provide an assessment of two innovative features designed to enhance the audio experience: Polycom® Acoustic Fence™ and NoiseBlock™. This document contains the results of our hands-on testing of these audio capabilities.

The Problem of Unwanted Noise

Those who participate in video and audio conference calls know that unwanted noise like air conditioning hiss, typing / keyboard noise, and road noise, is a major problem. This is especially true during large calls with many people (and many potential sources of noise).

At the very least, unwanted noise is a distraction. In some cases, the noise grinds the entire discussion to a screeching halt. And in the video world, the person or location generating the unwanted noise is often brought to the large window in the middle of the screen (a function called active speaker mode), which is both embarrassing and disruptive.

The best way to deal with unwanted noise is to avoid it altogether by participating from places less prone to unwanted noise. In real life, however, this is not always possible. The home office is susceptible to the dog barking and the neighbor's lawn mower. The meeting room is not impervious to HVAC noise or people speaking in the hall. And a person's office or cubicle is all too close to other people talking on the phone. And open workspaces, which are becoming more common throughout the enterprise, are notoriously noisy.

The takeaway here is that some unwanted noises can't be avoided. This forces the user to manually mute his mic to avoid interrupting the conversation. If the person forgets, the noise bleeds through. And when he speaks, he has to remember to unmute his mic. Obviously this is far from ideal.

This evaluation focuses on two innovative audio capabilities that block (or reduce) noise automatically, without forcing the users to manually mute their mics.

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[1] In September 2016, Polycom was acquired by private equity firm Siris Capital.
[2] Source: https://www.google.com/finance?fstype=ii&q=NASDAQ:PLCM

Understanding NoiseBlock

Concept:

Polycom NoiseBlock is a set of technologies designed to keep non-human noises (e.g. keyboard typing, paper shuffling, plastic bag rustling sounds, etc.) from impacting Polycom-powered video and audio calls.

NoiseBlock includes two elements that often work in tandem:

- Background Noise Reduction – a function that is enabled at all times and works to reduce constant background noise like noise created by fans and HVAC systems. This capability has been available for many years.

- Automatic Muting / Gating – a function that once enabled uses the system microphones to actively listen for human speech. If human speech is heard, it opens the system mic(s). Viewed another way, if only non-human sounds are present in a room, NoiseBlock keeps the mic(s) gated (closed).

Availability:

NoiseBlock is available on Polycom RealPresence Desktop software (RPD), RealPresence Mobile software, RealPresence Group Series video systems, RealPresence Trio, RealPresence Debut, and on the RealPresence Collaboration Server (RMX).

Installation / Configuration

NoiseBlock is a software feature that can be enabled within the user interface on supported devices. The standard ("generally available") version of NoiseBlock protects the outgoing audio signal (a benefit for remote participants) without forcing local users to constantly mute and unmute their mics.

In addition, RealPresence Group Series endpoints now include a beta-feature dubbed "Incoming NoiseBlock" that applies this same concept to incoming audio signals (a benefit for local participants – even if the remote participants do not have NoiseBlock).

Test Results

As a part of this effort, we tested NoiseBlock on a RealPresence Group 500 system and on a RealPresence Desktop client running on a Windows 10 PC. In each case, we exposed the local mics to non-human sound sources including loud air conditioning noise, a person typing loudly, and plastic bag rustling noise – all sounds one might find in an office or meeting room that would likely impact a conference call.

Overall, NoiseBlock worked exactly as advertised by completely eliminating non-human noises when speech audio was not present. And when a person spoke, NoiseBlock reacted quickly by opening the mic(s) – even when both speech and noise were present.

Our testing of Incoming NoiseBlock (beta – available on Group Series systems only) also yielded excellent results by blocking incoming noise from other non-NoiseBlock-capable participants without blocking our outgoing speech audio.

Additional Notes:

While not tested as a part of this assessment, NoiseBlock is also supported on the Polycom RealPresence Collaboration Server (RMX). This feature automatically blocks any incoming audio stream with noise only (and no speech). This provides NoiseBlock functionality without requiring each system (or any system) to support NoiseBlock.

Understanding Acoustic Fence

Concept:

Polycom Acoustic Fence is designed to minimize the impact of nearby noises (e.g. people talking in the next room or hallway) on Polycom-powered video and audio calls. Essentially, Acoustic Fence uses multiple mics (minimum of 2) to create a virtual "fence" between the noise source and the meeting participants. Once enabled, sounds outside of the fence are either blocked entirely or reduced.

Acoustic Fence includes two different elements that often work in tandem:

- Smart Gating – a function that closes (gates) the microphones when sound from only outside the fence area is detected

- Spectral Subtraction – a function that attempts to reduce (or even eliminate) sounds that originate from outside the fence area

Availability:

Acoustic Fence is available on Polycom VVX IP phones, RealPresence Desktop software, and RealPresence Group Series video systems.

Use in a Group Environment:

Installation / Configuration

Installing Acoustic Fence in a group video environment involves the placement of one or more Polycom mics (called the "fence" mics) [3] to create an audio detection zone (a.k.a. fence). The location and shape of the fence depends on the number and location of mics used. For example, a single fence mic can create a cone-shaped fence directly above the meeting room mic. Two or more mics can be used to create a bubble (left image) or a virtual wall (right image) for blocking noises from a specific location.

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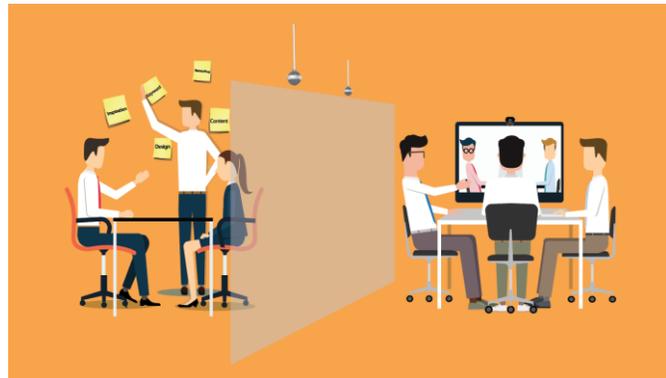
[3] While not exclusively so, most Acoustic Fence installations use Polycom Ceiling mics as the fence mics.

After installing the mics, the installer needs to, (1) enable Acoustic Fence within the user interface, and (2) choose the desired sensitivity which defines the size of the fence area.

To setup Acoustic Fence, we installed two Polycom ceiling mics in a conference room equipped with a Polycom RealPresence Group 500 system and a single Polycom table mic. We placed the ceiling (fence) mics at each end of our meeting room table approximately six (6) feet apart. We then enabled Acoustic Fence within the Group 500 user interface.

The Polycom web UI includes an indicator for whether a person speaking is inside or outside the fence area. We used this feature to verify our installation and set the fence sensitivity for our environment.

Enable Acoustic Fence:	☑	
Acoustic Fence Sensitivity:	4	⌄
You are outside the Acoustic Fence.		
		Save

Test Results

To test Acoustic Fence, we placed a number of video calls between our Acoustic Fence enabled RealPresence Group 500 system and several other Polycom and non-Polycom video systems.

Throughout our testing, the Smart Gating function worked well. Specifically, when sound from only outside the fence area was present, Acoustic Fence did not open the system mics. As a result, these sounds were not heard by the remote participants.

To test the Spectral Subtraction capability, we introduced noise (speech and other sounds) from various locations outside the fence area. Our testing revealed that the system's ability to block or reduce sounds from outside the fence area depended on one key item - the sound level picked up by the fence mic must be significantly higher than that picked up by the primary mic. This sound level difference depends on numerous factors including:

- The source location of the unwanted sound (e.g. the hallway outside the meeting room, or the far side of the large open workspace)

- The position of the fence mic(s) which determines the location and shape of the acoustic fence

- The room acoustics which can have a significant impact on the levels picked up by the fence and primary microphones

Our testing confirmed that assuming the fence mic(s) have been properly positioned, the spectral subtraction capability worked extremely well, eliminating almost all the unwanted sound from the outgoing audio.

Use with Polycom RealPresence Desktop (RPD) Software:

Installation / Configuration

To use Acoustic Fence with RealPresence Desktop software, the user must have two (2) connected and active microphones – a USB headset mic and a fence mic (e.g. a webcam mic or the built-in mic on a notebook, etc.). In addition, the user must enable Acoustic Fence within the RPD user interface.

For this assessment, we tested Acoustic Fence on two different systems:

- A Windows 10 PC running RealPresence Desktop and using a webcam mic as the fence mic
- A 27" iMac running RealPresence Desktop and using the integrated mic as the fence mic

Test Results

At first, to establish a baseline, we placed a few test calls using RealPresence Desktop with Acoustic Fence disabled and a pre-recorded speech clip playing in the background. This test revealed that the business-quality USB headsets that we use each day (Jabra, Plantronics) do a fine job at keeping local noise out of conference calls. This is not surprising given the following:

- Business headsets are designed to be used in noisy environments

- Headset mics in general are highly directional

- Headset mics are designed to sit very close to the sound source (the speaker's mouth), and thus have a very low sensitivity

We then gradually increased the volume of the speech clip to the point that it was louder than sound normally found in an office environment. At this level, the noise was loud enough to be a distraction to the local participant, and to be picked up by the headset mic and sent to the remote participants.

We then enabled Acoustic Fence and confirmed that using Acoustic Fence further reduces (or even eliminates) the local noise that is sent to the remote participants.

Additional Notes:

We also tested Acoustic Fence on a VVX 600 IP phone. In this case, the 600's speakerphone acted as the fence mic, and the handset or headset acted as the main microphone. In all cases, the test results were as expected - Acoustic Fence successfully blocked (or at least reduced) local noise.

Polycom RealPresence Group Systems also include a beta function called "Acoustic Fence with Beam Shaping" that uses a single Polycom table mic to create a cone-shaped Acoustic Fence. In this use case, one of the mics three elements acts as the primary (main) mic, while the other two elements act as fence mics. We tested this function and it worked as expected. However, as this disables 2/3rds of the Polycom mic's pickup pattern, we expect this to be useful in specific situations only.

Analysis and Conclusion

As a part of this effort, we tested Polycom NoiseBlock and Acoustic Fence capabilities in real-world situations ranging from a noisy meeting room to a noise-prone open workspace.

Our testing revealed that NoiseBlock (a free feature found on many Polycom devices) does a fine job of automatically keeping <u>non-human</u> noises from reaching remote participants (assuming the local person is not speaking at the same time).

Acoustic Fence, on the other hand, blocks or reduces the impact of any sounds, human or non-human, originating from specific locations (e.g. outside the meeting room or from the next cubicle).

Despite having a different form factor (several separate mics vs. a single device) and operating very differently, Acoustic Fence provides an experience similar to that provided by a mic array.[4]

- On the positive side, Acoustic Fence will likely be less expensive than competing mic array offerings. In addition, Acoustic Fence can be used with a Polycom table mic which means the mic will be relatively close to the participants. And once enabled, Acoustic Fence works automatically.

- On the negative side, installing Acoustic Fence involves more parts and cables than installing a mic array. It also requires a Polycom conferencing device or phone, while mic arrays are designed to hand-off audio signals to almost any device.

To be clear – NoiseBlock and Acoustic Fence cannot work miracles. However, in the right situation, these audio features can mean the difference between a successful or failed conference call.

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[4] A mic array is a device including numerous mic elements that work in tandem to create specific (and typically narrow) mic pickup areas. Mic arrays can be installed on ceilings, walls or tables.

Contributing Authors / Research Team

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About Wainhouse Research

Wainhouse Research, www.wainhouse.com, is an independent analyst firm that focuses on critical issues in the Unified Communications and Collaboration (UC&C). The company conducts multi-client and custom research studies, consults with end users on key implementation issues, publishes white papers and market statistics, and delivers public and private seminars as well as speaker presentations at industry group meetings.

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Polycom helps organizations unleash the power of human collaboration. More than 400,000 companies and institutions worldwide defy distance with secure video, voice and content solutions from Polycom to increase productivity, speed time to market, provide better customer service, expand education and save lives. Polycom and its global partner ecosystem provide flexible collaboration solutions for any environment that deliver the best user experience, the broadest multi-vendor interoperability and unmatched investment protection. Visit www.polycom.com or connect with us on Twitter, Facebook, and LinkedIn to learn more.

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