

Powerbank Regulator for PoE Loudspeakers

Popular Science Summary

Authors: Philip Löfgren and Tobias Bengtsson

Power over Ethernet (PoE) is a common technology used for cameras, loudspeakers and IoT-devices due to its practical way of providing both power and data in a single cable. Still many products use PoE classes that are limited in the power they can supply. Loudspeaker systems suffer from this restriction due to some audio signal's dynamic characteristics. While the average power needs to remain low, high audio peaks would benefit from having more. By switching to an "unlimited" powerbank supply at high demands in a controlled way speaker systems could be used at their full potential.

Nowadays, when wires have become one of the largest enemies to technology, and society can taste the sweet nectar of freedom, many areas that cannot fully embrace the warm, comfortable blanket that is wireless technology, simply seek to emulate its comfort by reducing the number of wires required. One such example is the innovative technology of Power over Ethernet (PoE), which delivers both power and data through a single, lonesome network cable. But, of course, this technology is far from perfect, and while the number of wires are reduced, so is the amount of power that can be delivered. And as is well known; with not-so-great power comes not-so-great responsibility, and thus some applications that utilize PoE may not receive the responsibility they deserve.

In an attempt to boost the reputation of one such application, namely PoE loudspeakers, a literal boost was developed and tested. This boost consists of a powerbank that provides all the support required for the speaker to temporarily raise the ceiling of its output volume.

Naturally, just like the farmer does not need to rent a tractor for longer than the harvesting season, it seems unnecessary to keep the powerbank active for an extended period of time. Instead, it is only active during instances when it is actually required.

To determine whether the powerbank is to be activated, an algorithm was developed. Like the wonderful Wizard of Oz, the algorithm analyzes, plans and magically provides solutions. When in reality, it simply tracks data and switches to the powerbank whenever a datapoint exceeds a predetermined threshold value.

The simplicity of the algorithm proved its worth during testing, as Dijkstra once said; "Simplicity is a prerequisite for reliability". As long as the threshold is properly set, the algorithm never fails to activate the powerbank in time for a peak of high demand. Measurements showed results promising enough to make even the most conservative audiophile to flicker his ear hair and wipe drool of his chin. The power was shown to be increased four-fold which translates to a 6 dB,SPL increase in output volume. Clippings of the signal disappeared quicker than a toupee in a hurricane, and the distortions of the system remained unaffected.

Unfortunately, no solution is ever perfect. While this project provided a proof of concept, there is more to be done before it can be release into the wild. The powerbank needs the ability to survive on its own, without the mother. It has to be able to utilize any spare power provided by the PoE to charge, which, is a problem someone in the near future will have to provide the solution for.