

How to create real-time audio appliances with Debian GNU/Linux

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Abstract

This hands-on workshop will introduce participants to methods for creating single-purpose GNU/Linux distributions for inexpensive ARM boards like the Raspberry Pi 3, and open source hardware including the BeagleBone Black. There will be an emphasis on optimising performance for demanding real-time audio applications such as xwax, as used in the PiDeck[1] project. Issues of maintainability, field upgrades and security will also be covered.

Keywords

GNU/Linux distributions, reference platforms, board support packages.

1 Requirements

Programming experience is not necessary for this workshop, but knowledge of the GNU/Linux command line and shell scripting would be an advantage. Please bring a laptop, a micro SD card of at least 1GB and a card reader/writer if you can. If you also have a Raspberry Pi 3, that would be helpful to bring.

2 Advantages of single-purpose distributions

While many users start their GNU/Linux journey with a general-purpose distribution such as Raspbian, audio appliances benefit from a more streamlined approach. We do not wish to have unnecessary services consuming system resources, especially when those services are bursty, potentially causing audio glitches.

Most audio appliances do not require a desktop interface, and some require no GUI whatsoever. Removing these unwanted packages greatly reduces the size of the deployment image, and the number of subsequent bug fixes and updates required. A stable audio appliance which meets its intended purpose and is not connected to public networks might never need to be updated at all, eliminating the chance that it will cease to function after an

upgrade failure, known as ‘bricking’ the device.

General-purpose distributions offer a cornucopia of libraries and other tools which the single-purpose device might never need, which in the case of a networked device have to be updated regularly for security reasons.

Typically, it is possible to reduce the installation image from more than a gigabyte to a few hundred megabytes or less, depending on the diversity of libraries required by the target audio application. Focused application selection can help reduce this dependency burden, for example by not combining programs written in too many different languages. This focus on dependencies also helps improve device maintainability, by limiting skill set requirements to programming languages that the project developers are familiar with.

A key advantage of the single-purpose distribution is the inclusion of a kernel tuned for audio performance, or non-standard audio hardware. The ability to boot directly into a custom kernel greatly simplifies post-installation deployment.

3 Acknowledgements

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References

- [1] DJ PiDeck: Raspberry Pi turntable <https://www.raspberrypi.org/magpi/pideck-raspberry-pi-dj-turntable/>