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Petitboot - A kexec based bootloader

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About Petitboot

Petitboot is a platform independent bootloader based on the Linux kexec warm reboot mechanism.

In essence, petitboot is a user friendly front end to the Linux kexec program.



Petitboot Features

- Load image files from any mountable Linux device or partition
- Load image files from network using TFTP, NFS, HTTP, HTTPS, SFTP
- Boot any operating system supported by kexec
- Reads configuration files from grub2, yaboot, kboot



Installation Methods

- As a standard user program to initiate a kexec reboot
 - Packages in Debian 7.0, Ubuntu 12.10, OpenWRT
- As a traditional 2nd stage bootloader image
 - petitboot, busybox, kexec-tools, etc. in embedded Linux initramfs
 - Configuration available in OpenWRT, Fedora (no longer maintained)



History

kboot

June 2005	kexec support merged for Linux-2.6.13
Summer 2005	Werner Almesberger creates 1st kexec based bootloader
September 2005	kboot-0 released
October 2005	Linux-Kongress presentation of kboot
August 2006	kboot released for PS3 game console

petitboot

Late 2006	Benjamin Herrenschmidt conceives idea of Petitboot
April 2007	Working implementation on PS3
April 2007	Petitboot package accepted into Fedora
December 2008	Petitboot package accepted into OpenWRT
December 2008	Jeremy Kerr begins work on client-server re-design
July 2009	ncurses version of petitboot released for PS3
March 2012	Petitboot package accepted into Debian



Design

- Client-server architecture
 - pb-discover, the petitboot discover server
 - petitboot-nc - ncurses based UI
 - petitboot-twin - TWIN based graphic UI
- Single thread, event driven server and UI programs
 - Programs register file descriptors used with poll()
 - System enters low power state while idle
- ncurses and TWIN framework for UI programs



PS3 Petitboot Demo

This demo shows connecting via telnet to a remote Sony PS3 game console that has petitboot installed as a 2nd stage bootloader. The bootloader image is a Linux kernel image with busybox, kexec-tools, and other petitboot dependencies contained within the embedded initrd filesystem of the kernel. The image was built with the OpenWRT embedded Linux distribution and installed to the boot area of the PS3 flash memory using the ps3-flash-memory utility.

The 'Set Video Mode' and 'Boot Game OS' menu items show how petitboot's UI framework can be used to customize petitboot for different platforms.

Petitboot has support for adding and editing menu items at run-time. By selecting a menu item and pressing the 'e' (edit) hot-key the 'Petitboot Option Editor' is opened where the 'image', 'initrd', and 'args' boot parameters can be edited. Similarly, by pressing the 'o' (open) hot-key, a new empty menu item is created and automatically opened in the Petitboot Option Editor. Currently petitboot has no facility to write menu edits back to config files, but the editing results are captured in the petitboot log files.

A 'netboot' item is present, indicating that pb-discover the petitboot server process has received boot info from a DHCP server on the network. In this case the netboot information is incomplete indicating that the DHCP server is not configured correctly.

The 'Exit to Shell' menu item exits the petitboot program and presents the user with a Linux shell prompt. This installation is a busybox based system that includes many of the standard shell commands and Linux utilities.

To aid in diagnosing user problems petitboot emits detailed log files. The pb-discover log includes parsed information from all udev and user events received. It also includes the status of all filesystem mount attempts and detailed config file parsing information. The Petitboot UI framework logs details of boot options received from pb-discover as well as details of screen rendering and processing of user input. The DHCP client helper pb-udhcpc logs its environment variables and details of the information it receives from the udhcpc program.



Ubuntu-12.10 Demo

This demo shows petitboot running as a user application on a kubuntu-12.10 installation in a VirtualBox VM. Ubuntu 12.10 includes a petitboot package that users can install to use petitboot to initiate a system reboot. This demo starts with an instance petitboot-nc, the ncurses based UI program. Petitboot locates and parses the grub2 configuration file maintained by ubuntu and the two boot items found are displayed in the petitboot menu.

When removable storage devices are added to the system the petitboot server pb-discover will receive information about that device from udev. pb-discover will then search for configuration information on the device and add the info found to its boot configuration data base and also forward the new information to any running petitboot UI programs.

Multiple UI programs can be running simultaneously and the demo shows starting an instance of petitboot-twin, the TWIN based GUI program, while an existing petitboot-nc program is already running. Removable storage events are sent to both UI programs and the demo shows both displaying new menu items when a USB storage device is attached.

One of the new boot options from the UDB device is to load the latest development build of the Fedora kernel and initrd via HTTP from the fedoraproject.org server.



Future

- Nikita Shulga is working to improve ARM kexec support
- Update petitboot and libtwin packages in OpenWRT and to add x86 and ARM build targets
- Fill out features and improve stability of petitboot-twin



More Info on Petitboot

Petitboot:

<http://www.kernel.org/pub/linux/kernel/people/geoff/petitboot/petitboot.html>

<http://git.kernel.org/?p=linux/kernel/git/geoff/petitboot.git>

Twin windowing system:

<http://keithp.com/~keithp/talks/twin-ols2005/>

Distros:

<http://packages.debian.org/sid/petitboot>

<http://dev.openwrt.org/wiki/ps3>

<https://admin.fedoraproject.org/pkgdb/acls/name/petitboot>

Kboot:

<http://kboot.sourceforge.netboot>



Abstract

Petitboot is a platform independent bootloader based on the Linux kexec warm reboot mechanism. Petitboot supports loading kernel and initrd image files from any mountable Linux device, plus can load image files from the network using TFTP, NFS, HTTP, HTTPS, and SFTP. Petitboot can boot any operating system supported by kexec.

In essence, petitboot is a user friendly front end to the Linux kexec program. If installed as a standard user program petitboot can be used as a convenient menu based way to initiate a kexec system reboot. A petitboot package is already available for several Linux distributions.

Petitboot can also be used as a traditional 2nd stage bootloader by including the petitboot program and necessary dependencies like busybox and kexec-tools in the embedded initramfs of a Linux kernel image and converting that kernel image to a form that is loadable by the 1st stage bootloader. The method of creating the initramfs, converting the Linux kernel image to a 2nd stage bootloader image, and arranging for the petitboot program and its dependencies to be started on boot are all specific to the platform, the Linux distribution, and the 1st stage bootloader.

Discussions in this session can explore methods to prepare a petitboot 2nd stage package for various distributions, requests for petitboot enhancements, etc.