The Haiku Package Manager

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My name is Richard Zak
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Haiku: History

From Haiku’s website:

*Haiku is an open-source operating system that specifically targets personal computing. Inspired by the BeOS, Haiku is fast, simple to use, easy to learn and yet very powerful.*

BeOS image from ArsTechnica.com.
What is Haiku?

- Single-user, Unix-inspired, desktop operating system
  - Executables and libraries are ELFs
  - Bash is the default shell for the Terminal
  - SSH is included, client & server
  - Many programs work on Haiku with a simple recompile, simple build changes, simple header changes.
  - Most programs are compiled with Make, CMake, gcc. LLVM is available too.
  - It’s not Linux, BSD, etc. Haiku has its own unique kernel.
- Inspired by BeOS, which was inspired by the Classic Mac OS
- Exists solely because of its developer & user community, volunteer efforts, and donations. There’s no corporate sponsorship.
- Now works on RISC-V. Work is in progress for ARM64 support, plus others.
- ... and it’s 20 years old! The project was formed in 2001, with its first release in 2002.
Haiku Packages

The usual features:

- Separate packages for the application, development, source
- Retrieval of packages, including dependencies, from a repository
- Architecture-aware

Some unique features

- Package contents are mounted as read-only into the file system
- Packages can indicate which libraries and/or commands are provided, allowing for easier dependency management
  - Packages can have a dependency specified as `lib:jpeg` vs. `libjpeg-2.0.3`. Because it is `libjpeg` or `libjpeg-turbo8`, for example?
- The file system knows which package is the origin for a given file.
- The boot loader knows about the package manager.

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Haiku Packages

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- The boot loader knows about the package manager.
Packaged Files & Directories are Read-Only

Since the package contents are mounted from the package itself on to the file system, the files and directories are read-only.

- Made possible by separating the package file into equal-sized chunks and compressing individually, enabling cheap random access into the compressed file.
- This benefits the user, since it’s guaranteed that the file can’t be modified, either accidentally or intentionally.
- This benefits the developer, since it’s guaranteed that the program and it’s supporting files will be present in the known relative paths.
- The user can side-step this, if desired, to install software in /boot/system/non-packaged/
- Since the installed packages are on disk, making them redistributable (if offline, for example) is possible.
The Boot Manager is Package-Aware

Welcome to the
Haiku Boot Loader

Copyright 2004-2020 Haiku, Inc.

Select Haiku version

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The Boot Manager is Package-Aware

- Prior states allowing going back to how the system was previously
  - Including Haiku itself, since it’s also in a package.
- Immensely helpful for operating system development, debugging
- Prevents the user from being completely locked out of their system
Metadata in Packages

Package information:

- **Basics**: name, description, software license
- **Provides**: indicates if a package provides a library, `lib:foo` or command, `cmd:bar`
- **Other packages**, and the command line, can specify dependencies on by referring to the the library name or command without having to specify which package exactly.
- **Example**: `pkgman install cmd:foo`
Considerations when Porting

Generally, from a packaging perspective, porting to Haiku isn’t too difficult. But there are some things to be considered:

- A lot of the same files exist on Haiku, but in different locations.
  - `/etc/resolv.conf` → `/boot/system/settings/network/resolv.conf`
  - Configuration dot files in the home directory should now be in `/boot/home/config/settings/` (convention)

- Directories from a package are read-only, so, for example, using Python’s `pip` becomes problematic, as `/boot/system/lib/python3.7/` and its subdirectories are read-only. Solution:
  - Package the desired module into a Haiku package, or
  - install the package in `/boot/system/non-packaged/lib/python3.7`, or
  - create a virtual environment in the home directory, `/boot/home`. 
Demo!

There’s another neat feature of Haiku’s packaging system...
The Filesystem is Package-Aware

```bash
~> ls /boot/system/apps/GZDoom/
brightmaps.pk3  GZDoom  gzdoom.pk3  GZDoomLauncher  lights.pk3  zd_extra.pk3
~>
```
The Filesystem is Package-Aware

If you move the system folder or its contents, you won't be able to boot Haiku!

Are you sure you want to do this?

To move the system folder or its contents anyway, hold down the Shift key and click "Move".
The Filesystem is Package-Aware

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The Haiku Package Manager

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Terminal: home: --

```
~> ls /boot/system/apps/GZDoom/
brightmaps.pk3  GZDoom gzdoom.pk3  GZDoomLauncher lights.pk3 zd_extra.pk3
~> ls /boot/system/apps/GZDoom/
ls: cannot access '/boot/system/apps/GZDoom/': No such file or directory
~>
```
The Filesystem is Package-Aware

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The Filesystem is Package-Aware

- Removing a package from the packages directory, /boot/system/packages/, uninstalls the package.
  - The system warns you that is is probably a bad idea.
  - It can be done anyway by holding the shift key.
- Putting the package back into the packages directory re-installs the package.
The BeFS attribute `SYS:PACKAGE_FILE` shows the package which is the source for a given file.
Questions?

Learn more about Haiku: https://www.haiku-os.org/

GitHub: https://github.com/haikuports/haikuports/
IRC: #haiku on OFTC

Discuss: https://discuss.haiku-os.org
Twitter: https://twitter.com/haikuOS
Discord: https://discord.gg/8KsjHbW
Creating Packages

- Packages are created with a simple text file which contain metadata, typically in the root directory of the files to be packages, named “.PackageInfo”

- Required fields:
  - name
  - version
  - architecture – Specific architecture, list of architectures, or “any”
  - summary
  - description
  - packager – Person who packaged the software
  - licenses – Must be a license name known to the packager
  - provides – List of software names, executables, and/or libraries and version number
  - requires – List of required packages and/or libraries, optionally with version requirements
Creating Packages

- Directory contains the directories & files to be packages
  - `bin/` in the project will be mounted as `/boot/system/bin/package_name/`
  - `lib/` in the project will be mounted as `/boot/system/lib/package_name/`
- Command: `package create -C /path/to/dir/ -b Output.hpkg`
- Example: `https://github.com/rjzak/ghidra/blob/master_haiku64/.PackageInfo`
HaikuPorts

- Haiku has a vast collection of ported software, called HaikuPorts.
  - https://github.com/haikuports/haikuports

- HaikuPorts contains recipes to build software, and patches (if needed) to enable or improve Haiku support. These are built automatically and added to the repository.

- HaikuPorter helps build applications from HaikuPorts, and is used by the main package repository but can be run locally.
  - https://github.com/haikuports/haikuporter
  - https://github.com/haikuports/haikuports.cross for cross compiling for different architectures, with RISC-V getting a lot of attention recently