

# OpenBSD: add VMM to 'packer'

The red pill taken to develop a Go 'plugin' for packer.io to be able to create VM images on OpenBSD for VMM and many other virtualizers.

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sysfive.com portfolio

- Continuous system and application operation
- Collaborations with Providers, Developers, Services and QA
- Hybrid cloud provisioning
- cost efficient scaling on commodity HW
- scale out to AWS/GCE/Azure/..
- Incident, problem, disaster response
- Service availability independent of solution scenario
- migrate from or to private/public cloud or own HW
- robust, scalable technology portfolio
- continuous improvements in security and server architecture
- coherent provisioning across platforms (dev/stage/live)
- vendor/provider independence, OSS focus



## Ze problems I tackle

- VM guest keepers need bootable stuff
- "infrastructure to go"
- reproducibility
- cross-host / virtualizer (OSX, OpenBSD, AWS / VirtualBox, VMM, AMI)

## Solutions / Approaches

- `my-imager.sh`
- `curl github | sh`
- `my-cold-hands` ("VM guy is AWOL")
- `deploy.pl` ;-)
- `packer` (o'rly)

# What's packer anyway?

Packer is an open source tool for creating *identical* machine images for multiple platforms from a *single source* configuration. Packer is lightweight, runs on every major operating system, and is highly performant, creating machine images for multiple platforms *in parallel*.

Packer does not replace configuration management like Chef or Puppet. In fact, when building images, Packer is able to use tools like Chef or Puppet to install software onto the image.

- written in golang
- small core providing communications (rpc)
- everything else is a plugin (but linked into one binary)
- configuration in one JSON file (+optional variables)

## forms in the sandbox / Terminology

### Artifacts

Outcome of a "Build", e.g. AMI, .vmdk, .box

### Builds

The actual running task producing above artifacts

### Builders

Code to steer the VM host, handle disk images, etc (see below)

### Provisioners (optional)

Additional treatment, installation goes here and range from simple inline shell scripts to full-blown ansible, Chef, ..

### Post-processors

Treat the Artifacts after creation, e.g. compress, upload AWS, ..

### Templates

The JSON files defining all of the above (and some) - NOT a VM "template"

## Builders + Post-Provisioning

By default the following “builder” engines are supported. Where needed the accompanying “post-processor” is typically available, too (e.g. EC2/AMI upload):

Alicloud ECS, Amazon EC2, Azure, CloudStack, DigitalOcean, Docker, File, Google Cloud, Hetzner Cloud, HyperOne, Hyper-V, Linode, LXC, LXD, NAVER Cloud, Null, 1&1, OpenStack, Oracle, Parallels, ProfitBricks, QEMU, Scaleway, Tencent Cloud, Triton, Vagrant, VirtualBox, VMware, Yandex.Cloud.

Further “builders” can be found in the wild and are just added as a single go binary in certain paths (e.g. `~/.packer.d/plugins/`)

By default additional provisioning support for the following tools:

Ansible, Breakpoint, Chef, Converge, File, InSpec, PowerShell, Puppet, Salt Masterless, Shell.

# OpenBSD VMM

## vmm(4)

virtual machine monitor (VMM) providing the required resources for the VMs (CPU, Disk, Net) and handles the necessary memory mapping (isolation).

## vmd(8)

userland daemon to interact with vmm(4) to create actual VMs and handle their lifecycle through:

## vmctl(8)

administrative tool to create, start/stop, etc VMs. In this scope also the main 'interface' for the packer builder plugin.

## vm.conf(5)

configuration file for vmd(8), persist VM/network configurations.

## doas(1)

While most tasks the “builder” can (and should!) run as unprivileged user, some commands need to be run as root. The plugin does so automatically. **Caveat:** needs 'nopass' for now (no tty), 'persist' typically timeouts too early.

## OpenBSD dependencies / configuration

- /etc/pf.conf:

```
1 pass in quick proto { udp tcp } from 100.64.0.0/10 to any port domain \  
2     rdr-to $dns_server port domain  
3 pass out quick on $ext_if from 100.64.0.0/10 to any nat-to $ext_if
```

- /etc/sysctl.conf

```
1 net.inet.ip.forwarding=1
```

- vmd(8)

```
1 rcctl enable vmd  
2 rcctl start vmd
```



## Enough Introduction..

Questions so far? Keep 'em until the end, way too big a stage here

# Plugin development

## tools + space

- pkg\_add: golang, packer, git
- \$VISUAL / \$EDITOR
- diskspace: 1.5G go-dependencies + generated images/diskfiles

## directory layout

- / - Makefile, main.go, go.mod
- /builder/packer-builder-openbsd-vmm - work cellar

# Plugin development

## what is doing what

### Makefile

Targets: build, install, vmb, fmt, vet, test, clean, uninstall

### main.go

- "import" builder
- initialize builder as a "server" plugin
- register builder (rpc configuration)
- "daemonize", spinning mode, ..

## config.go

holds the configuration struct read from template (JSON)

## builder.go

- new - instantiate driver with global vars/logs
- prepare - populate configuration
- run - tokenize build into "steps", hand over "artifact" information
- cancel - clean up the mess if SIGABRT

## driver.go

Interact via vmctl(8) to create disks, start/stop the VM. Gather additional information like tap(4) IP address. **Fixme:** Get information of “ifconfig tap” to find the IP address. Currently there’s some assumption about how VM-Id and tapN correlate (or not). awk->golang or ioctl needed.

Also interface with the VM (serial console) to "type" so called boot\_command. Additionally catching all the output into a logfile (linefeed).

## step\_\*.go

The various “steps” needed to create an artifact (next page)

## “Stepping the build”

step\_outdir.go

create a directory that will hold the artifacts

step\_create\_disks.go

create the empty disk that will be installed on (via vmctl, no doas).

step\_get\_vm\_params.go

Put information about the VM into the 'state bag', to be consumed by following steps.

step\_launch\_vm.go

Start a VM (via "driver") with above created disk and the configured options (name, memory, kernel). **Fixme:** shutdown the VM if there are errors (right now I don't, because debug and auto\_install(8) already stops the VM)

step\_bootcmd.go

- Get configuration (IP/port) from the built-in httpd
- gather the configured boot\_command, enrich with above data
- "type" the command via the connected serial console. Basically the httpd cannot run on 80/tcp, so auto\_install will fail-ask for the URL and the plugin provides this (e.g. http://100.64.1.2:8230/packer-auto\_install.conf)

## \* DEMO TIME\*

```
1 {
2   "builders": [
3     {
4       "type": "openbsd-vm",
5       "name": "packer-obsd64-vm-amd64",
6       "vm_name": "myvm",
7       "disk_size": "1500M",
8       "disk_format": "raw",
9       "output_directory": "images",
10      "http_directory": "./docroot",
11      "iso_image": "~/Downloads/install65.iso",
12      "bios": "/bsd.rd",
13      "boot_wait": "5s",
14      "boot_command": [
15        "A<enter>",
16        "http://{{ .HTTPIP }}:{{ .HTTPPort }}/packer-auto_install.conf<enter>",
17      ],
18      "ssh_username": "root"
19    }
20  ]
21 }
```

ascinema play auto-install-demo.cast

# Status

- VMM: everything on deck (full/real PXE would be add-on)
- plugin: all architectural integration (config/builder/driver)
- plugin\_steps: create disk/VM/boot/provide auto\_install infra

# Outlook

## Fixme / Finish

- GetTapIpAddress
- more observation than fixed timeouts - if possible

## Needables

- plugin: provide/check dependencies (vmd running, pf.conf)
- plugin: make it a ports-pkg
- plugin: support fiddlings (like variables for boot\_command, basically there)
- plugin: config item 'disklabel'
- plugin: multiple disks
- plugin: "complex" networking?
- plugin: adapt to upcoming VMM features



## Integration (Puffalanche)

- make 'vagrant' a port and use it as a vbox post-processor
- Cloudify the clones (cloud-init, context,..)
- "Ecosystem" - cloud at puffy fingertips (hi mischa, sorry)
- Disk resizing (maybe not needed with images-a-la-carte..)

## Ohai + Links + Thanks

- Code/Slides - <https://v.gd/packobsd>
- Kickoff - Glarus, Switzerland / <https://hack4glarus.ch>
- Thanks to Claudio for the idea of `vmctl -B`
- Thanks to gubernaut for `go.mod`, review, ISO+QCOW2 support and other spurious fixes
- Any help/pull request very welcome (e.g. multi-disk)

Questions?



**BEER** after the closing session

**DO NOT MISS** - see you there

Code/Slides -

<https://github.com/double-p/packer-builder-openbsd-vm>

<https://github.com/double-p/presentations>



# Golang

- GOPATH (disk sizes/isolation)
- go.mod/go.sum
- go vet
- go fmt
- // interface{ }