

# FreeNAS and bhyve

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Where the shark bites the hive

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# Agenda

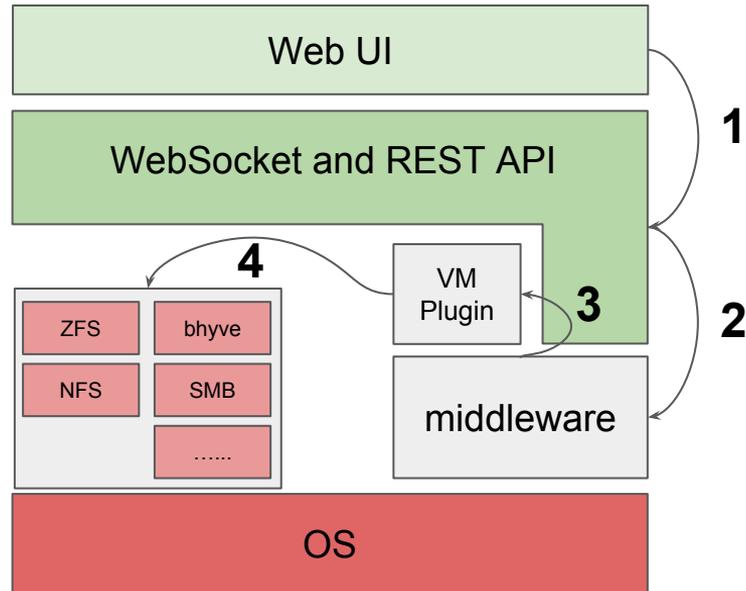
- ❑ Who am I?
- ❑ FreeNAS and bhyve architecture
- ❑ FreeNAS and bhyve in numbers
- ❑ FreeNAS new UI
- ❑ devel/libbhyve-remote
- ❑ devel/bhyve-vm-goagent
- ❑ WIP: bee prepared

# About me

- ❑ Name: Marcelo Araujo
- ❑ FreeBSD ports bit since 2007
- ❑ FreeBSD src bit since 2015
- ❑ Working for iXsystems Inc. since December/2016
- ❑ Github: araujbsd
- ❑ Interested in bhyve since 2014



# FreeNAS and bhyve Architecture



1. UI WebSocket/Rest calls to middleware
2. Middleware provides WebSocket and primary functionality
3. Provides methods related to VMs and interactions with the userland
4. Userland: bhyve, bhyvectl, grub-bhyve...

# What we want to achieve?

- ❑ Allow FreeNAS/TrueNAS to provide a hybrid storage solution
- ❑ Offer more alternatives to Jails for FreeNAS users
- ❑ Provide users a friendly virtualization experience
- ❑ Easy to use and intuitive UI, removing bhyve complexities
- ❑ Provide more external tooling for user VM management

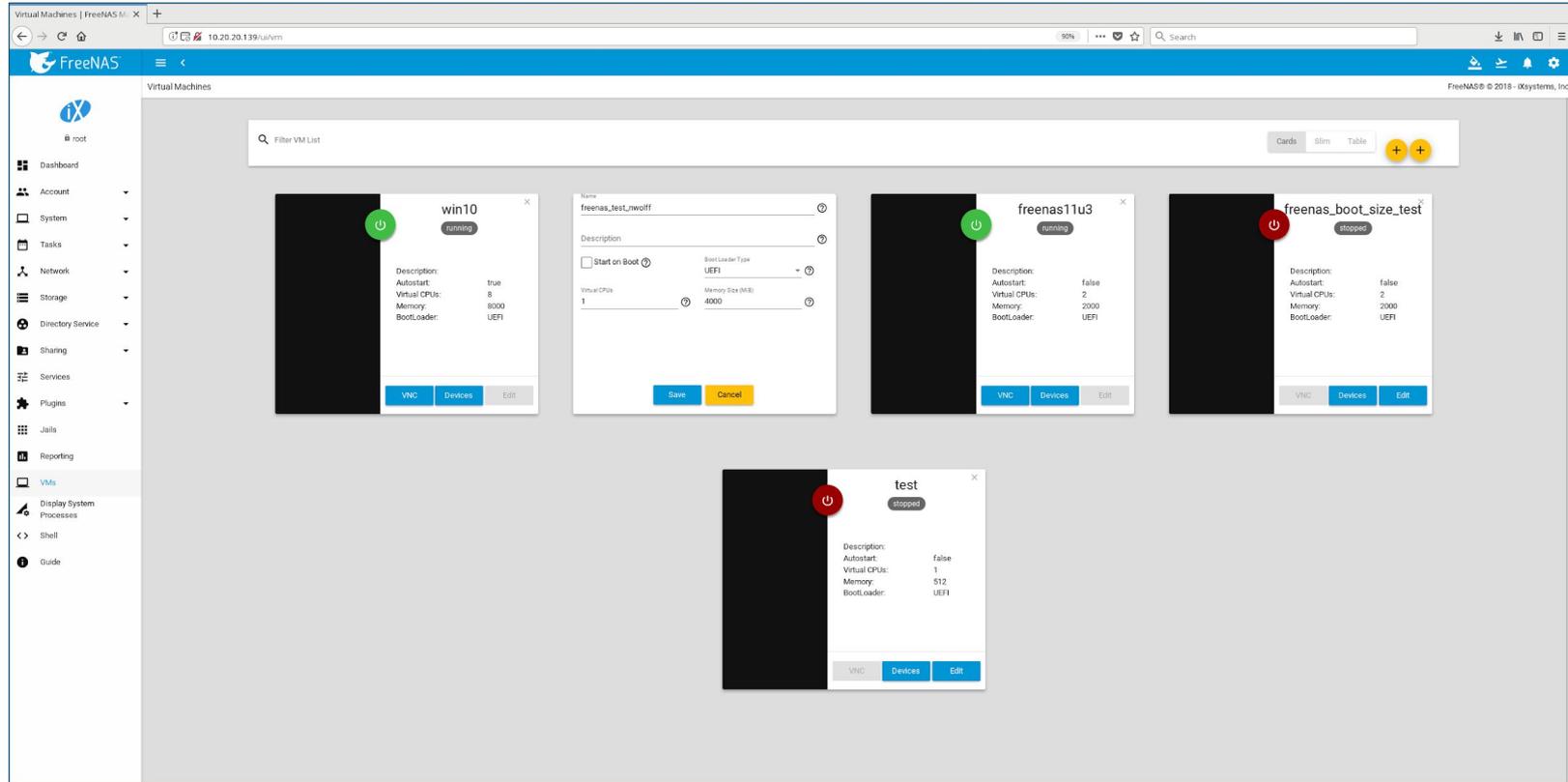
# FreeNAS and bhyve by the numbers

- ❑ FreeNAS has 10+ Million downloads and over 200K active users
- ❑ FreeNAS Forum has 61,012 users
  - ❑ 2.200 posts only related with bhyve
- ❑ We introduced the VM feature in February of 2017
- ❑ bhyve officially available on FreeNAS 11.0
- ❑ From that point to the present, 244 bhyve-related bugs have been reported
- ❑ 21 bugs related to VNC support alone

# FreeNAS new UI

- ❑ New UI made with Angular
- ❑ VM Wizard: Six steps to create a VM
- ❑ Friendly and intuitive UI
- ❑ Access VMs with VNC Web interface
- ❑ Flip Cards that are awesome
- ❑ ... and more to come

# FreeNAS new UI: VM List



The screenshot displays the FreeNAS web interface for managing virtual machines. The main area shows a list of VMs with their status and configuration details. The interface includes a search bar, view options (Cards, Slim, Table), and a sidebar with navigation menus.

**Virtual Machines List:**

Name	Status	Description	Autostart	Virtual CPUs	Memory	Boot Loader
win10	running		true	8	8000	UEFI
freenas_test_nwloff	stopped			1	4000	UEFI
freenas11u3	running		false	2	2000	UEFI
freenas_boot_size_test	stopped		false	2	2000	UEFI
test	stopped		false	1	512	UEFI

**Configuration Details for 'win10':**

- Name: win10
- Status: running
- Description: (empty)
- Autostart: true
- Virtual CPUs: 8
- Memory: 8000
- Boot Loader: UEFI

**Configuration Details for 'freenas\_test\_nwloff':**

- Name: freenas\_test\_nwloff
- Status: stopped
- Description: (empty)
- Start on Boot:
- Boot Loader Type: UEFI
- Virtual CPUs: 1
- Memory Size (MB): 4000

**Configuration Details for 'freenas11u3':**

- Name: freenas11u3
- Status: running
- Description: (empty)
- Autostart: false
- Virtual CPUs: 2
- Memory: 2000
- Boot Loader: UEFI

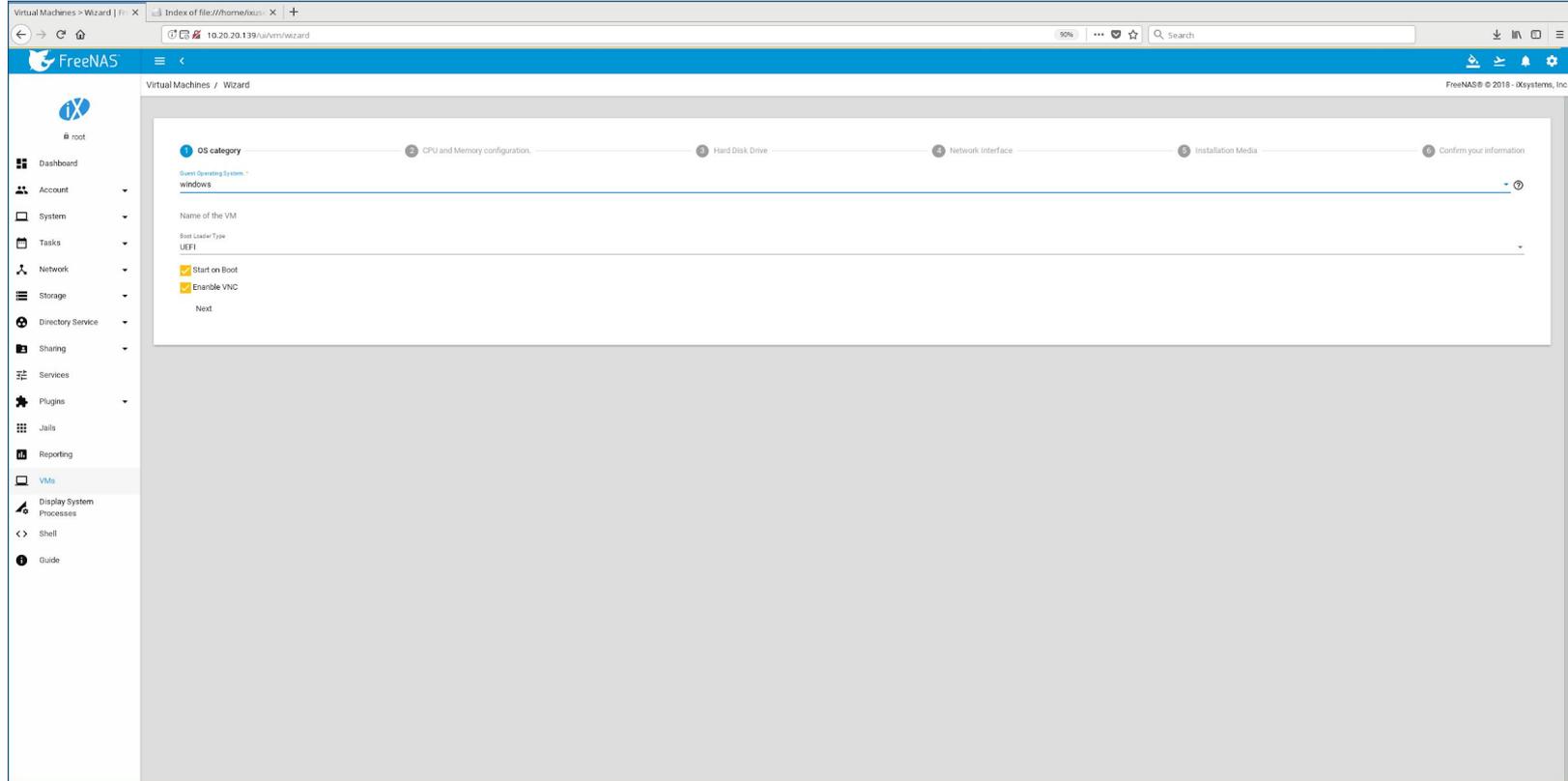
**Configuration Details for 'freenas\_boot\_size\_test':**

- Name: freenas\_boot\_size\_test
- Status: stopped
- Description: (empty)
- Autostart: false
- Virtual CPUs: 2
- Memory: 2000
- Boot Loader: UEFI

**Configuration Details for 'test':**

- Name: test
- Status: stopped
- Description: (empty)
- Autostart: false
- Virtual CPUs: 1
- Memory: 512
- Boot Loader: UEFI

# FreeNAS new UI: Wizard



The screenshot displays the FreeNAS web interface for the Virtual Machines Wizard. The browser address bar shows the URL `10.20.20.139/nas/vm/wizard`. The interface features a blue header with the FreeNAS logo and navigation icons. A left sidebar contains a menu with categories like Dashboard, Account, System, Tasks, Network, Storage, Directory Service, Sharing, Services, Plugins, Jails, Reporting, VMs, Display System, Processes, Shell, and Guide. The main content area shows a progress bar with six steps: 1. OS category (active), 2. CPU and Memory configuration, 3. Hard Disk Drive, 4. Network interface, 5. Installation Media, and 6. Confirm your information. Under the 'OS category' step, there is a dropdown menu for 'Guest Operating System' with 'windows' selected. Below this, there are input fields for 'Name of the VM' and 'Boot Loader Type' (set to 'UEFI'). There are also two checked checkboxes: 'Start on Boot' and 'Enable VNC', followed by a 'Next' button. The footer of the page indicates 'FreeNAS © 2015 - iXsystems, Inc.'

# FreeNAS new UI: Graphs

The screenshot displays the FreeNAS web interface for managing Virtual Machines. The main content area is titled "Virtual Machines Summary" and includes a donut chart showing storage usage for the "zpool".

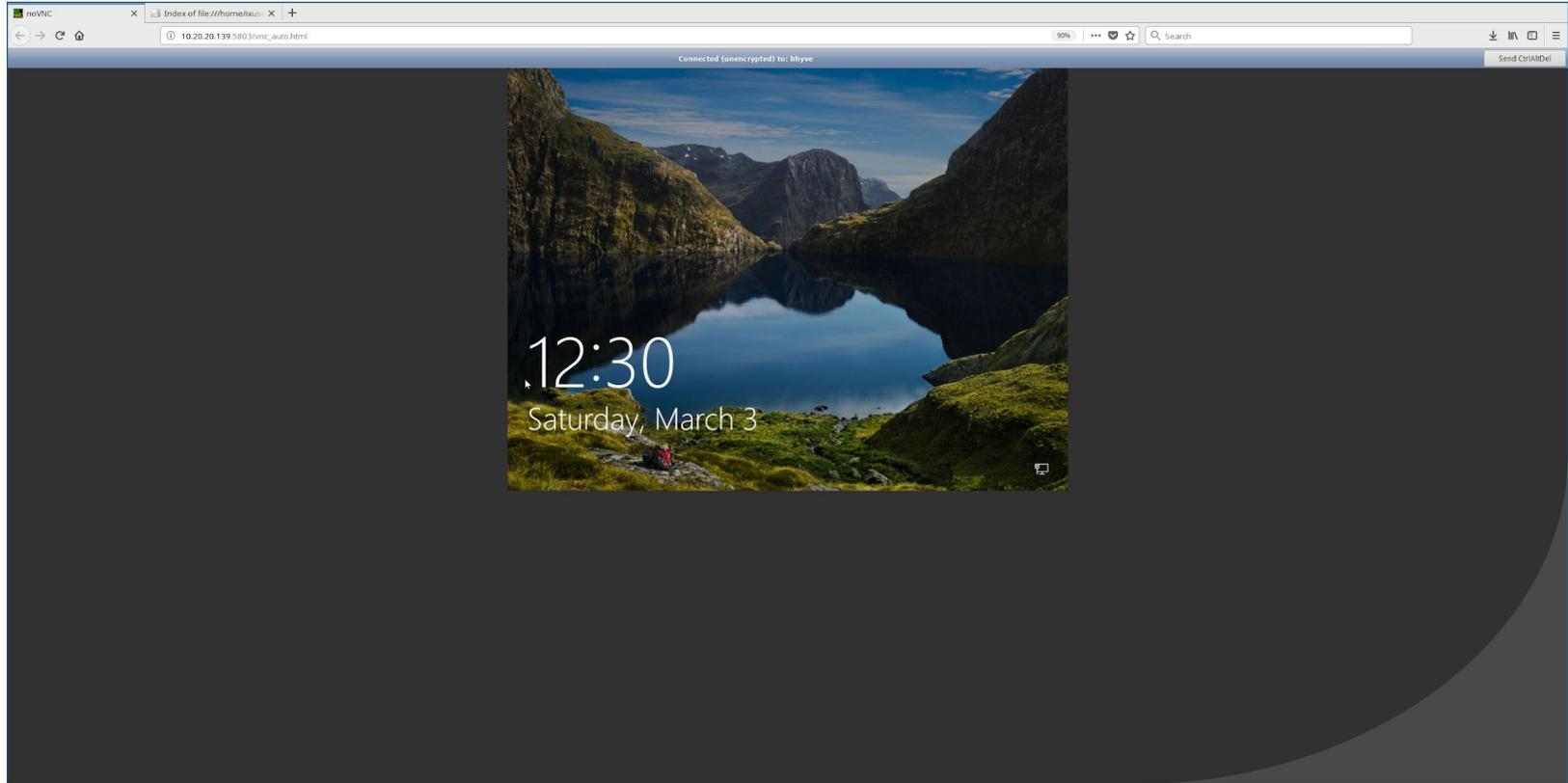
**Virtual Machines Summary**

Used: 1149.73GB (96.9%) Available: 39970.27GB

State	Name	Description	vCPUs	Memory	Bootloader	Actions
🟢	win10			8000	UEFI	⋮
🔴	freenas_test_lwolfof			4000	UEFI	⋮
🟢	freenas_1tu3			2000	UEFI	⋮
🔴	freenas_boot_size_test			2000	UEFI	⋮
🔴	test			512	UEFI	⋮

5 total

# FreeNAS new UI: VNC Web



# devel/libhyve-remote

- ❑ A library that aims to abstract functionality from other third party libraries such like libvncserver, freerdp and spice
- ❑ Uses a dynamic linker, loads only functionality from other libraries that are necessary to launch the service
- ❑ Created mainly to solve some bugs we had with VNC implementation reported on FreeNAS
- ❑ Now we only support libvncserver

# devel/libhyve-remote

- ❑ Some issues that libhyve-remote solves with VNC:
  - ❑ Better compatibility with different VNC clients
  - ❑ IPv6 support
  - ❑ Non-US keyboard
  - ❑ Better cursor handler
  - ❑ Fewer glitches updating screen
  - ❑ Better compression
  - ❑ Password authentication (It is already in the RFB implementation)

# devel/libhyve-remote

- ❑ How to use it with bhyve?
  - ❑ `cd /usr/ports/devel/libhyve-remote`
  - ❑ `make config`, select BHYVE
  - ❑ `libhyve-remote` is installed, and `bhyve` is patched,, rebuilt, and reinstalled
  - ❑ If something goes wrong, it falls back to RFB `bhyve` implementation ;)
  - ❑ Launch `bhyve` with the new option, ex.:

“**-s 29,fbuf,vncserver,....**”

# devel/bhyve-vm-goagent

- ❑ An agent in Go that runs inside a guest vm and allows host hypervisor to obtain information from guest VMs
- ❑ Supports virtio-console and WebSocket protocol
- ❑ Pre-built binaries, i386 & amd64, for FreeBSD, Linux, NetBSD and Windows
- ❑ Information available from guest VM: mem, cpu, nics, uptime and ping
- ❑ Easily extended to do anything else

# devel/bhyve-vm-goagent

- ❏ How to use:

- ❏ Host:

- ❏ Launch the guest VM with the virtio-console parameter:

```
“-s 2,virtio-console,org.freenas.bhyve-agent=/tmp/FreeBSD12.sock“
```

# devel/bhyve-vm-goagent

- ❑ How to use:
  - ❑ Guest:
    - ❑ Download the binary compatible with your guest OS
    - ❑ From inside your VM:

```
kldload virtio_console
```

```
./bhyve-vm-goagent-freebsd-386 -virtio
```

# devel/bhyve-vm-goagent

- ❑ How to obtain guest information:
  - ❑ Host:
    - ❑ We provide tools like goserial

```
root@freenas:/tmp # ./goserial -socket="/tmp/FreeBSD12.sock" -ether -uptime
```

```
Result:
```

```
[{"mtu":1500,"name":"em0","hardwareaddr":"00:a0:98:1e:c0:08","flags":["up","broadcast","multicast"],"addr s":[{"addr":"192.168.100.193/24"}]}
```

```
{"mtu":16384,"name":"lo0","hardwareaddr":"","flags":["up","loopback","multicast"],"addrs":[{"addr":"","1/128"}, {"addr":"fe80::1/64"}, {"addr":"127.0.0.1/8"}]}
```

```
Result: {"seconds":5742,"days":0,"hours":1,"minutes":35}
```

# WIP: bee prepared

- ❑ A new tool for manage bhyve will come this year
- ❑ Improve bhyve-vm-goagent
- ❑ Extend libbhyve-remote to support at least freerdp

# References:

## ❑ libhyve-remote:

- ❑ GitHub: <https://github.com/freenas/libhyve-remote>
- ❑ Review: <https://reviews.freebsd.org/D11768>
- ❑ Ports: devel/libhyve-remote

## ❑ bhyve-vm-goagent:

- ❑ GitHub: <https://github.com/freenas/bhyve-vm-goagent>
- ❑ Ports: devel/bhyve-vm-goagent

# Thank you!

