



Forester

Lukáš "Izap" Zapletal

@lzap | @lzap@mastodon.social

<https://lukas.zapletalovi.com>



Introduction



Why?

An image-based unattended
network boot provisioning
story for Fedora.



Inspiration

- Anaconda "liveimg" feature
- Image Builder (osbuild)
- Foreman / Red Hat Satellite
- Beaker
- Canonical MaaS
- Tinkerbell



Red Hat

Beaker



tinkerbell 

 MAAS



Project Forester

- image-based
- bare-metal or virtualization
- out-of-band (Redfish)
- Anaconda installer
- EFI HTTP Boot
- SecureBoot
- HTTPS
- DHCPv4/DHCPv6

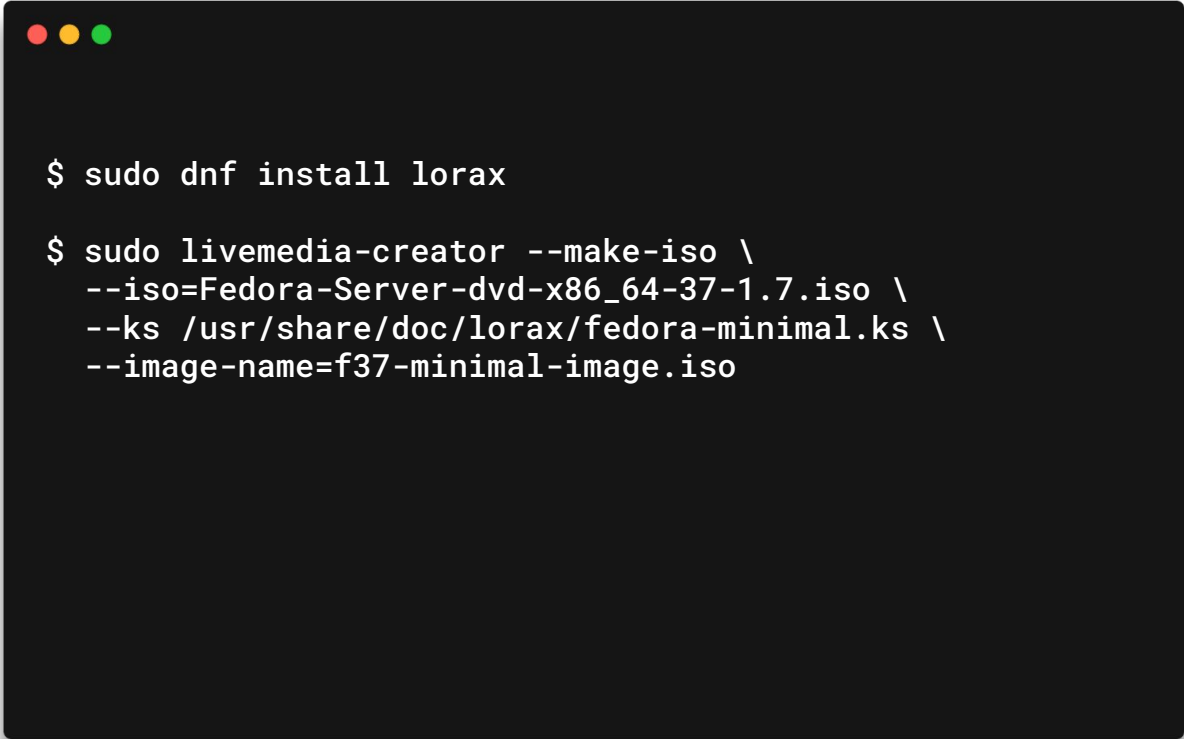
The Forester workflow: á la carte menu

- Appliance (Redfish chassis or libvirt host)
- System (physical or virtual server)
- Image (ISO file built by image-builder)

1. The **appliance** is **registered**.
2. The **system** is **enlisted**.
3. The ISO image is **uploaded**.
4. The **system** is enlisted, powered on and **discovered**.
5. The user **lists** available **systems** and **images**.
6. The user **acquires** the system and assigns the uploaded image to it.
7. After a workload, the user **releases** the system.

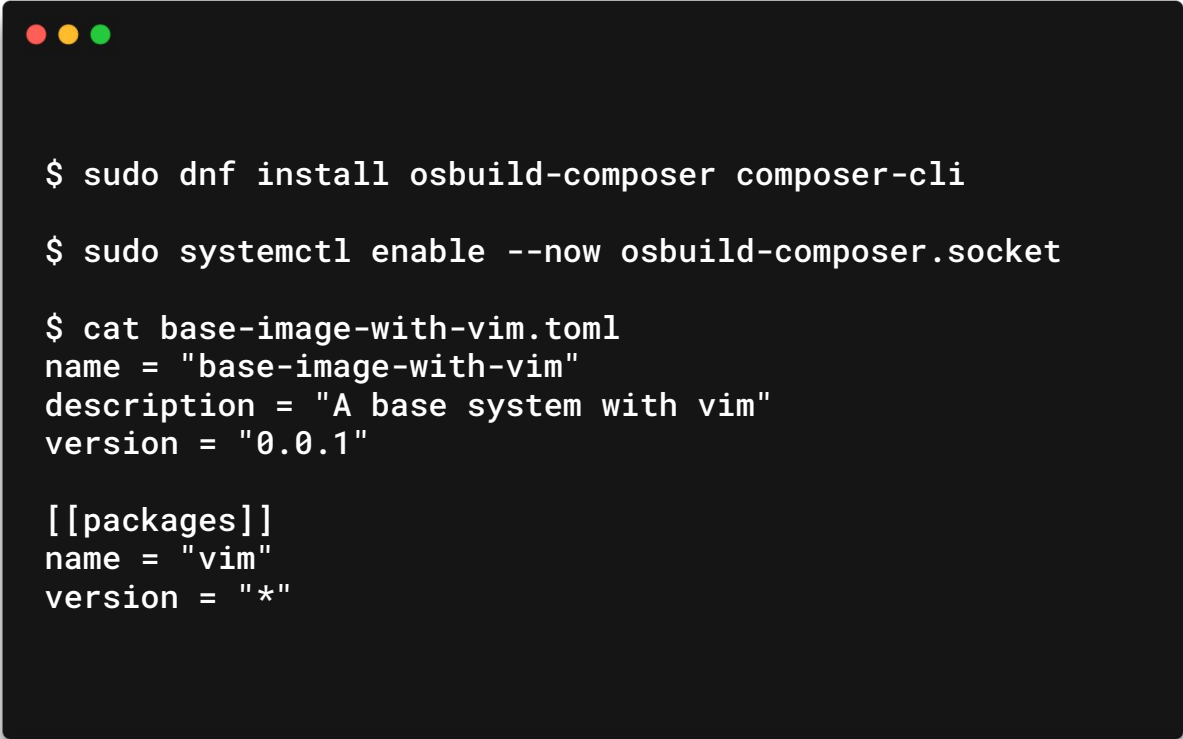
Creating Images





```
$ sudo dnf install lorax
```

```
$ sudo livemedia-creator --make-iso \  
  --iso=Fedora-Server-dvd-x86_64-37-1.7.iso \  
  --ks /usr/share/doc/lorax/fedora-minimal.ks \  
  --image-name=f37-minimal-image.iso
```



```
$ sudo dnf install osbuild-composer composer-cli
```

```
$ sudo systemctl enable --now osbuild-composer.socket
```

```
$ cat base-image-with-vim.toml  
name = "base-image-with-vim"  
description = "A base system with vim"  
version = "0.0.1"
```

```
[[packages]]  
name = "vim"  
version = "*"
```

```
$ composer-cli blueprints push base-image-with-vim.toml
```

```
$ composer-cli compose start \  
  base-image-with-vim \  
  image-installer  
Started compose XXXX
```

```
$ composer-cli compose list
```

ID	Status	Blueprint	Type
XXXX	FINISHED	base-image-with-vim	image-installer

```
$ composer-cli compose results XXXX
```












root@nuc.home.lan

home.zapletalovi.com:9090/composer#/Fedora38

Back to blueprints > Fedora38

Fedora38
Minimum installation

Customizations Packages Images

Services	Filesystem	Kernel	FIDO Device Onboard
 Add services	 Add manual filesystem	 Add kernel	 Set FDO
Firewall	SSH Keys	Timezone	OpenSCAP
 Add firewall	 Add ssh keys	 Set timezone	 Set OpenSCAP
	Groups	Locale	Ignition
	 Add groups	 Add locale	 Add ignition

Search

Apps Edit

Image Builder

System

Overview

Logs

Storage

Networking

Virtual machines

Accounts

Services

Tools

Applications

SELinux

Software updates

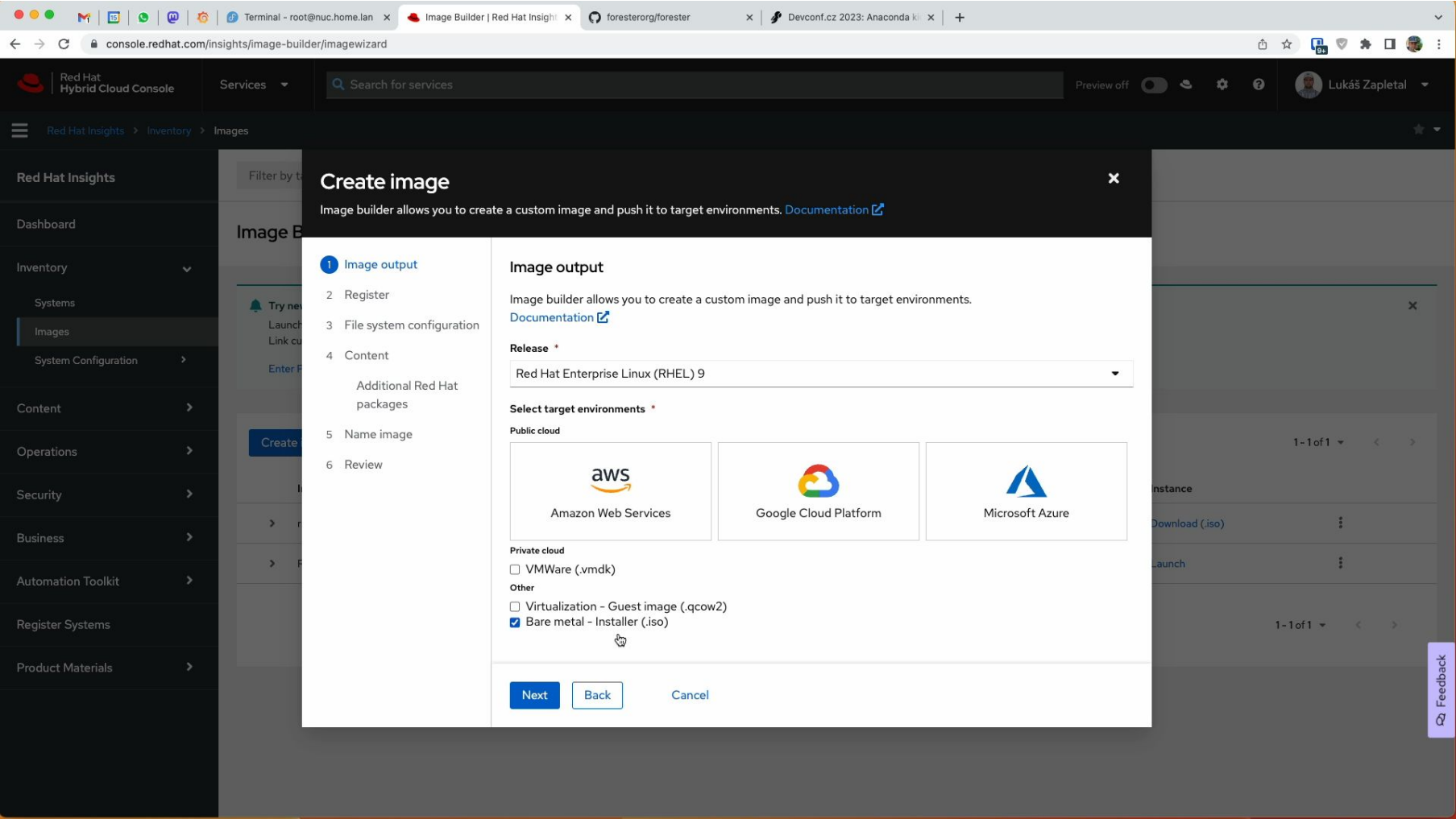
Terminal

Help

Session

Edit blueprint

Create image



Create image

Image builder allows you to create a custom image and push it to target environments. [Documentation](#)

1 Image output

- 2 Register
- 3 File system configuration
- 4 Content
 - Additional Red Hat packages
- 5 Name image
- 6 Review

Image output

Image builder allows you to create a custom image and push it to target environments. [Documentation](#)

Release *

Red Hat Enterprise Linux (RHEL) 9

Select target environments *

Public cloud



Amazon Web Services



Google Cloud Platform



Microsoft Azure

Private cloud

VMWare (vmdk)

Other

Virtualization - Guest image (.qcow2)

Bare metal - Installer (.iso)

Next

Back

Cancel

Feedback

Installation and setup



▼ Assets

12

 forester-cli-0.0.3-darwin-amd64.tar.gz	5.44 MB	Sep 13
 forester-cli-0.0.3-darwin-arm64.tar.gz	5.15 MB	Sep 13
 forester-cli-0.0.3-linux-amd64.tar.gz	5.55 MB	Sep 13
 forester-cli-0.0.3-linux-arm64.tar.gz	5.1 MB	Sep 13
 forester-cli-0.0.3-windows-amd64.zip	5.56 MB	Sep 13
 forester-controller-0.0.3-darwin-amd64.tar.gz	10.7 MB	Sep 13
 forester-controller-0.0.3-darwin-arm64.tar.gz	10.3 MB	Sep 13
 forester-controller-0.0.3-linux-amd64.tar.gz	10.8 MB	Sep 13
 forester-controller-0.0.3-linux-arm64.tar.gz	10 MB	Sep 13
 forester-controller-0.0.3-windows-amd64.zip	10.8 MB	Sep 13
 Source code (zip)		Sep 13
 Source code (tar.gz)		Sep 13



```
$ podman volume create forester-pg
$ podman volume create forester-img

$ podman pod create --name forester -p 8000:8000

$ podman run -d --name forester-pg --pod forester \
  -e POSTGRESQL_USER=forester \
  -e POSTGRESQL_PASSWORD=forester \
  -e POSTGRESQL_DATABASE=forester \
  -v forester-pg:/var/lib/pgsql/data:Z \
  quay.io/fedora/postgresql-15; sleep 5s

$ podman run -d --name forester-api --pod forester \
  -e DATABASE_USER=forester \
  -e DATABASE_PASSWORD=forester \
  -e IMAGES_DIR=/img \
  -v forester-img:/img:Z \
  quay.io/forester/controller:latest
```




iDRAC Settings

[Overview](#)

[Connectivity](#)

[Services](#)

[Users](#)

[Settings](#)

> Local Configuration

> Web Server

> SSH

> Remote RACADM

> SNMP Agent

> Automated System Recovery Agent

▾ Redfish

Enabled

Enabled ▾

Apply

Discard

HTTP Device1	Enabled
HTTP Device2	Disabled
HTTP Device3	Disabled
HTTP Device4	Disabled

HTTP Device1 Settings

	Current Value
Interface	Embedded NIC 1 Port 1 Partition 1
Protocol	IPv4
VLAN	Disabled
VLAN ID	1
VLAN Priority	0
DHCP	Enabled
IP Address	
Subnet Mask	
Gateway	
DNS info via DHCP	Enabled
Primary DNS	
Secondary DNS	
URI (will obtain from DHCP server if not specified)	http://forester:8000/boot/shim.efi

```
● ● ●  
$ sudo vi /etc/dhcp/dhcpd.conf
```

```
...
```

```
class "httpclients" {  
    match if substring (option vendor-class-identifier, 0, 10) = "HTTPClient";  
    option vendor-class-identifier "HTTPClient";  
    filename "http://192.168.42.1:8000/boot/shim.efi";  
}
```

```
subnet 192.168.42.0 netmask 255.255.255.0 {  
    range dynamic-bootp 192.168.42.100 192.168.42.200;  
    default-lease-time 14400;  
    max-lease-time 172800;  
}
```

```
...
```

```
$ sudo virsh net-edit default
```

```
<network xmlns:dnsmasq='http://libvirt.org/schemas/network/dnsmasq/1.0'>
```

```
<name>default</name>
```

```
...
```

```
<dnsmasq:options>
```

```
<dnsmasq:option
```

```
  value='dhcp-vendorclass=set:efi-http,HTTPClient:Arch:00016' />
```

```
<dnsmasq:option
```

```
  value='dhcp-option-force=tag:efi-http,60,HTTPClient' />
```

```
<dnsmasq:option
```

```
  value='dhcp-boot=tag:efi-http,&quot;http://192.168.122.1:8000/boot/shim.efi&quot;' />
```

```
</dnsmasq:options>
```

```
</network>
```

Virtual machines - root@nuc.hi x Image Builder | Red Hat Insight x foresterorg/forester x Devconf.cz 2023: Anaconda ki x +

home.zapletalovi.com:9090/machines#vm?name=test1&connection=system

root@nuc.home.lan

Search

Apps Edit

Image Builder

System

Overview

Logs

Storage

Networking

Virtual machines

Accounts

Services

Tools

Applications

SELinux

Software updates

Terminal

Virtual machines > test1

test1 Run

Overview

General

Connection System

State Shut off

Memory 4.0 GiB edit

CPU 2 vCPUs, host passthrough edit

Boot order network edit

Autostart Run when host boots

Watchdog none add

Vsock none add

Hypervisor details

Emulated machine pc-q35-7.2

Firmware UEFI

Console

Please start the virtual machine to access its console.

Usage

Memory 0 / 4 GiB

CPU 0% of 2 vCPUs

Disks

Device	Used	Capacity	Bus	Access	Source	Additional
--------	------	----------	-----	--------	--------	------------

Add disk

https://home.zapletalovi.com:9090/composer

Use



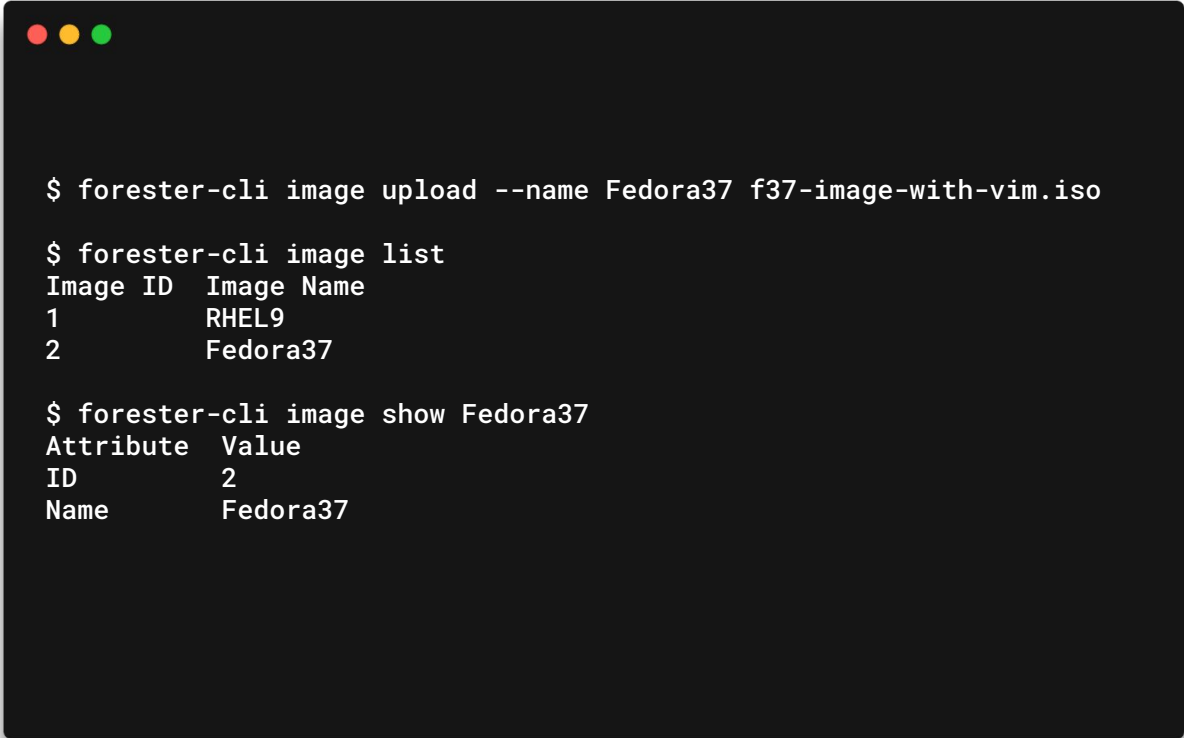
```
$ forester-cli -h
Usage: forester-cli [--url URL] [--config CONFIG] <command> [<args>]
```

Options:

```
--url URL [default: http://localhost:8000]
--config CONFIG [default: config/forester.env]
--quiet
--verbose
--debug
--help, -h           display this help and exit
```

Commands:

```
image           image related commands
system          system related commands
appliance       appliance related commands
```



```
$ forester-cli image upload --name Fedora37 f37-image-with-vim.iso
```

```
$ forester-cli image list
```

Image ID	Image Name
1	RHEL9
2	Fedora37

```
$ forester-cli image show Fedora37
```

Attribute	Value
ID	2
Name	Fedora37


```
$ forester-cli appliance create \  
  --kind redfish \  
  --name dellr350 \  
  --uri https://root:calvin@dr350-a14.local
```

```
$ forester-cli appliance create \  
  --kind libvirt \  
  --name virt \  
  --uri tcp://hypervisor:16509
```

```
$ forester-cli appliance list
```

ID	Name	Kind	URI
1	virt	1	tcp://hypervisor:16509
2	dellr350	2	https://root:calvin@dr350-a14.local



```
$ forester-cli appliance enlist dellr350
```

```
$ forester-cli system list
```

ID	Name	Hw Addresses	Acquired	Facts
1	Lynn Viers	6c:fe:54:70:60:10 (4)	false	Dell PowerEdge R350

```
$ forester-cli system show Viers
```

Attribute	Value
ID	1
Name	Lynn Viers
Acquired	false
Acquired at	Mon Sep 4 14:40:50 2023
Image ID	1
MAC	6c:fe:54:70:60:10
MAC	c4:5a:b1:a0:f2:b5
MAC	6c:fe:54:70:60:11
MAC	c4:5a:b1:a0:f2:b4
Appliance Name	dellr350
Appliance Kind	2
Appliance URI	https://root:calvin@dr350-a14.local
UID	4c4c4544-004c-3510-804c-c4c04f435731



...

Fact	Value
redfish_manufacturer	Dell Inc.
redfish_memory_bytes	8589934592
redfish_model	PowerEdge R350
redfish_name	System
redfish_oid	/redfish/v1/Systems/System.Embedded.1
redfish_part_number	0MTYYTA02
redfish_pcie_dev_count	9
redfish_processor_cores	4
redfish_processor_count	1
redfish_processor_model	Intel(R) Xeon(R) E-2314 CPU @ 2.80GHz
redfish_serial_number	MXWSJ0032100HI
redfish_sku	DL5XXXX

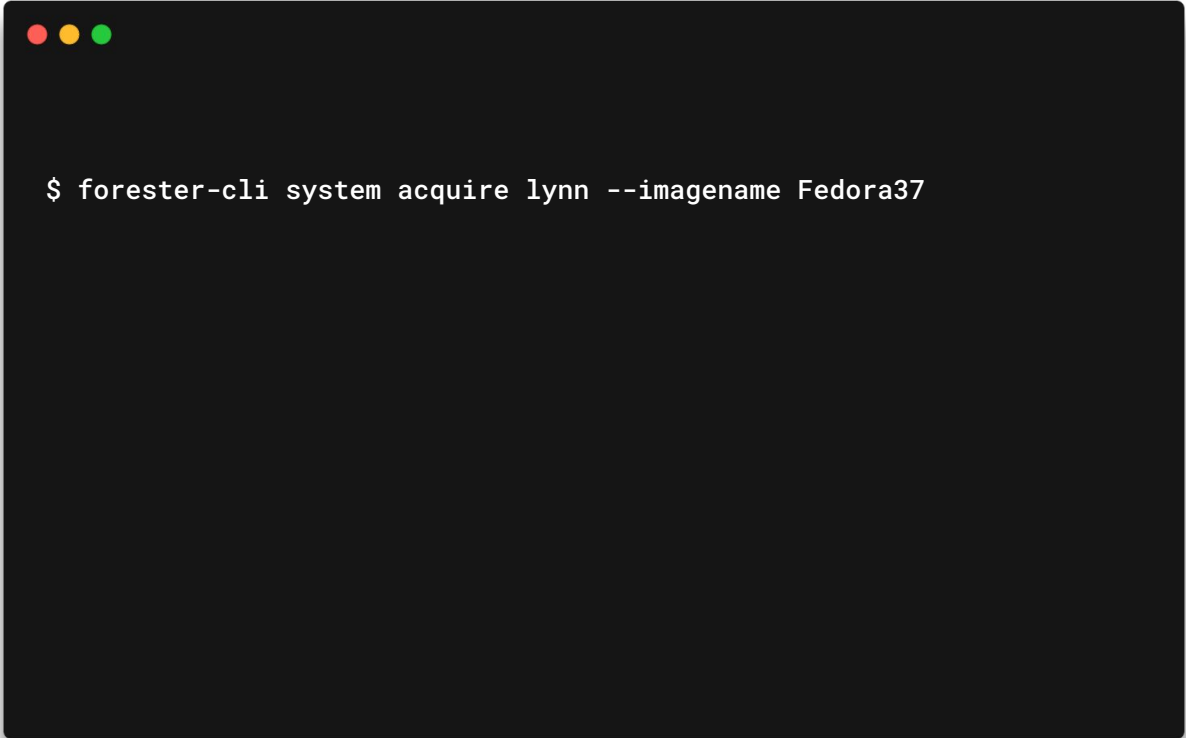
...



...

Fact	Value
baseboard-manufacturer	Dell Inc.
baseboard-product-name	0MTYYT
baseboard-serial-number	.DL5XXXX.MXWSG0000000HE.
baseboard-version	A02
bios-release-date	11/14/2022
bios-revision	1.5
bios-vendor	Dell Inc.
bios-version	1.5.1
chassis-asset-tag	Not Specified
chassis-manufacturer	Dell Inc.
chassis-serial-number	DL5XXXX
chassis-type	Rack Mount Chassis
chassis-version	Not Specified

...



```
$ forester-cli system acquire lynn --imagename Fedora37
```

Virtual machines - root@nuc.h... Image Builder | Red Hat Insi... foresterorg/forester Devconf.cz 2023: Anaconda ki...

home.zapletalovi.com:9090/machines#/vm/console?name=test1&connection=system

root@nuc.home.lan

Virtual machines > test1 > Console

test1 [Shut down]

VNC console [Send key] [Disconnect]

```
>>Start PXE over IPv4.
  Station IP address is 192.168.122.46

  Server IP address is 192.168.122.1
  NBP filename is USE_HTTP
  NBP filesize is 0 Bytes
  PXE-E23: Client received TFTP error from server.
BdsDxe: failed to load Boot0001 "UEFI PXEv4 (MAC:5254002C22EA)" from PciRoot(0x0)/Pci(0x2,0x0)/Pci(0x0,0x0)/MAC(5254002C22EA,0x1)/IPv4(0.0.0.0,0x0,DHCP,0.0.0.0,0.0.0.0,0.0.0.0) : Not Found

>>Start PXE over IPv6.
  PXE-E21: Remote boot cancelled.
BdsDxe: failed to load Boot0002 "UEFI PXEv6 (MAC:5254002C22EA)" from PciRoot(0x0)/Pci(0x2,0x0)/Pci(0x0,0x0)/MAC(5254002C22EA,0x1)/IPv6(0000:0000:0000:0000:0000:0000:0000:0000,0x0,Static,0000:0000:0000:0000:0000:0000:0000:0000,0x40,0000:0000:0000:0000:0000:0000:0000:0000) : Not Found

>>Start HTTP Boot over IPv4...
  Station IP address is 192.168.122.46

  URI: http://nuc.home.lan:8000/boot/shim.efi
  File Size: 946736 Bytes
  Downloading...100%BdsDxe: loading Boot0003 "UEFI HTTPv4 (MAC:5254002C22EA)" from PciRoot(0x0)/Pci(0x2,0x0)/Pci(0x0,0x0)/MAC(5254002C22EA,0x1)/IPv4(0.0.0.0,0x0,DHCP,0.0.0.0,0.0.0.0,0.0.0.0)/Uri(0.0.0.0)
BdsDxe: starting Boot0003 "UEFI HTTPv4 (MAC:5254002C22EA)" from PciRoot(0x0)/Pci(0x2,0x0)/Pci(0x0,0x0)/MAC(5254002C22EA,0x1)/IPv4(0.0.0.0,0x0,DHCP,0.0.0.0,0.0.0.0,0.0.0.0)/Uri(0.0.0.0)
```

Open Platform Firmware Development

Virtual machines - root@nuc.hi x | Image Builder | Red Hat Insights x | foresterorg/forester x | Devconf.cz 2023: Anaconda ki x | +

home.zapletalovi.com:9090/machines#/vm/console?name=test1&connection=system

root@nuc.home.lan

Virtual machines > test1 > Console

test1 Shut down ⋮

VNC console Send key Disconnect

```
Starting installer, one moment...
anaconda 34.25.2.18-1.el9_2 for Red Hat Enterprise Linux 9.2 started.
* installation log files are stored in /tmp during the installation
* shell is available on TTY2
* if the graphical installation interface fails to start, try again with the
  inst.text bootoption to start text installation
* when reporting a bug add logs from /tmp as separate text/plain attachments
```

[anaconda1]~# 2:shell 3:log 4:storage-log 5:program-log Switch tab: alt+tab | Help: F1

- root@nuc.home.lan
- Search
- Apps Edit
- Image Builder
- System
- Overview
- Logs
- Storage
- Networking
- Virtual machines
- Accounts
- Services
- Tools
- Applications
- SELinux
- Software updates
- Terminal

Virtual machines > test1 > Console

test1 Shut down ⋮

VNC console

Send key Disconnect

```
Downloading http://nuc.home.lan:8000/img/1/living.tar.gz (88%)
Downloading http://nuc.home.lan:8000/img/1/living.tar.gz (81%)
Downloading http://nuc.home.lan:8000/img/1/living.tar.gz (82%)
Downloading http://nuc.home.lan:8000/img/1/living.tar.gz (83%)
Downloading http://nuc.home.lan:8000/img/1/living.tar.gz (84%)
Downloading http://nuc.home.lan:8000/img/1/living.tar.gz (85%)
Downloading http://nuc.home.lan:8000/img/1/living.tar.gz (86%)
Downloading http://nuc.home.lan:8000/img/1/living.tar.gz (87%)
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Downloading http://nuc.home.lan:8000/img/1/living.tar.gz (91%)
Downloading http://nuc.home.lan:8000/img/1/living.tar.gz (92%)
Downloading http://nuc.home.lan:8000/img/1/living.tar.gz (93%)
Downloading http://nuc.home.lan:8000/img/1/living.tar.gz (94%)
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Downloading http://nuc.home.lan:8000/img/1/living.tar.gz (98%)
Downloading http://nuc.home.lan:8000/img/1/living.tar.gz (99%)
Downloading http://nuc.home.lan:8000/img/1/living.tar.gz (100%)
.
Installing.
Installing software 7%
Installing software 14%
Installing software 19%
Installing software 26%
Installing software 35%
Installing software 48%
Installing software 51%
Installing software 55%
Installing software 63%
Installing software 67%
Installing software 68%
Installing software 77%
Installing software 81%
Installing software 82%
Installing software 89%
Installing software 99%
.
Configuring storage
[anaconda1] main* 2:shell 3:log 4:storage-log 5:program-log
```



```
$ forester-cli system release lynn
```

Going forward...

- Configurable drive partitioning
- Out of band management
 - libvirt
 - Redfish
 - IPMI
 - VMWare
- Terraform / Packer plugin
- Ansible module and inventory
- Integrate with
 - Pulp
 - Foreman

Thank you

Reach out to me at the Fedora booth.

<https://foresterorg.github.io>

