

**Cloud-init:
The cross-cloud
magic sauce.**

Scott Moser / Chad Smith
smoser / blackboxsw @
FreeNode #cloud-init
OSS Europe '18: Edinburgh



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CANONICAL

Summary

- What is cloud-init
- Where does it run?
- Goals that drive development.
- How does it work?
- What can you do with it?
- New features
- Demo

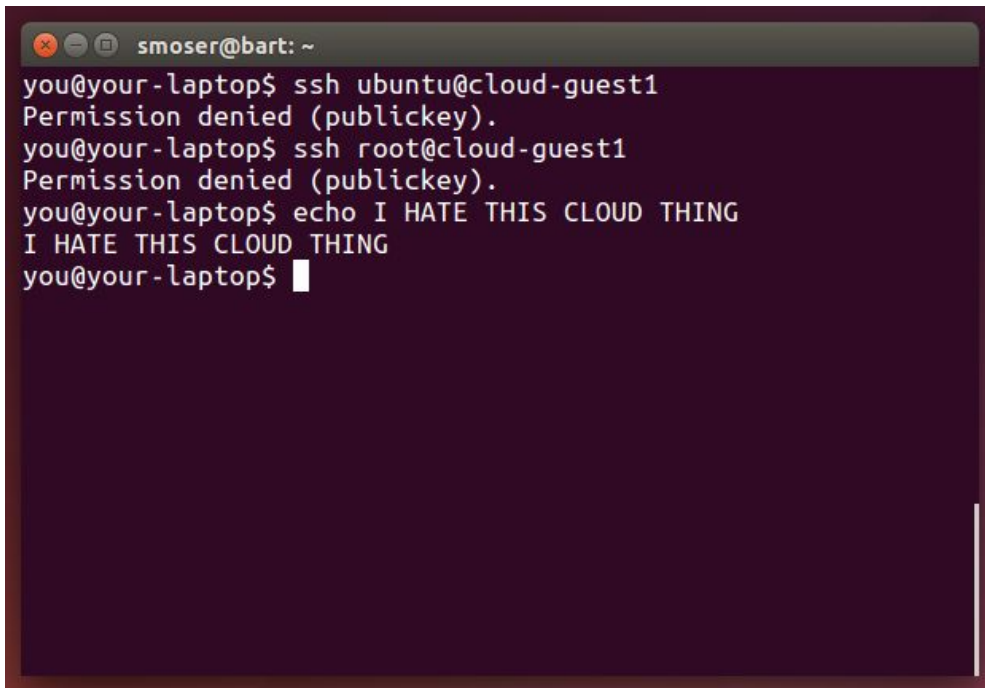
What is cloud-init?

Cloud Init is cross platform cloud instance initialization software.

That didn't help. Maybe tell me what problem it solves?

Why is cloud-init?

Basic instance initialization.

A terminal window with a dark purple background and a title bar that reads "smoser@bart: ~". The terminal shows a series of commands and their outputs. First, the user runs "ssh ubuntu@cloud-guest1", which results in "Permission denied (publickey).". Then, the user runs "ssh root@cloud-guest1", which also results in "Permission denied (publickey).". Finally, the user runs "echo I HATE THIS CLOUD THING", which outputs "I HATE THIS CLOUD THING". The prompt "you@your-laptop\$" is visible at the end of each line.

```
smoser@bart: ~  
you@your-laptop$ ssh ubuntu@cloud-guest1  
Permission denied (publickey).  
you@your-laptop$ ssh root@cloud-guest1  
Permission denied (publickey).  
you@your-laptop$ echo I HATE THIS CLOUD THING  
I HATE THIS CLOUD THING  
you@your-laptop$
```

Why is cloud-init?

Ahh. That's better.

```
ubuntu@trusty-20150430-220608: ~  
you@your-laptop$ ssh root@cloudhost  
Please login as the user "ubuntu" rather than the user "root".  
  
Connection to cloudhost closed.  
you@your-laptop$ ssh ubuntu@cloudhost  
Welcome to Ubuntu 14.04.2 LTS (GNU/Linux 3.13.0-49-generic x86_64)  
  
* Documentation:  https://help.ubuntu.com/  
  
System information disabled due to load higher than 1.0  
  
Get cloud support with Ubuntu Advantage Cloud Guest:  
  http://www.ubuntu.com/business/services/cloud  
  
Last login: Thu Apr 30 22:15:40 2015 from 10-5-0-2.openstacklocal  
ubuntu@trusty-20150430-220608:~$  
ubuntu@trusty-20150430-220608:~$ echo 'I <3 Cloud [go cubs]'  
I <3 Cloud [go cubs]  
ubuntu@trusty-20150430-220608:~$
```

Turn This

The screenshot shows the AWS Management Console interface for the 'EC2 Management Console'. The top navigation bar includes the AWS logo, 'Services', 'Resource Groups', and user information. The main content area is titled 'Step 1: Choose an Amazon Machine Image (AMI)' with a 'Cancel and Exit' link. Below the title, a search bar is present. The left sidebar shows navigation options like 'Quick Start', 'My AMIs', 'AWS Marketplace', and 'Community AMIs'. The main list displays two AMIs: 'amzn2-ami-hvm-2.0.20181008-x86_64-gp2' and 'amzn-ami-hvm-2018.03.0.20180811-x86_64-gp2'. A red circle highlights the pagination text '1 to 50 of 116,040 AMIs' in the top right of the list area.

EC2 Management Console

https://console.aws.amazon.com/ec2/v2/home

aws Services Resource Groups

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Add Tags 6. Configure Security Group 7. Review

Step 1: Choose an Amazon Machine Image (AMI) [Cancel and Exit](#)

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. You can select an AMI provided by AWS, our user community, or the AWS Marketplace; or you can select one of your own AMIs.

Search for an AMI by entering a search term e.g. "Windows"

Quick Start

My AMIs

AWS Marketplace

Community AMIs

Operating system

Amazon Linux

1 to 50 of 116,040 AMIs

amzn2-ami-hvm-2.0.20181008-x86_64-gp2 - ami-0922553b7b0369273

Amazon Linux 2 AMI 2.0.20181008 x86_64 HVM gp2

64-bit

Root device type: ebs Virtualization type: hvm ENA Enabled: Yes

Select

amzn-ami-hvm-2018.03.0.20180811-x86_64-gp2 - ami-0ff8a91507f77f867

Amazon Linux AMI 2018.03.0.20180811 x86_64 HVM GP2

64-bit

Select

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Into This

The screenshot shows the AWS Management Console interface for the 'Step 1: Choose an Amazon Machine Image (AMI)' task. The top navigation bar includes the AWS logo, 'Services', 'Resource Groups', and user information. The breadcrumb trail shows the steps: 1. Choose AMI, 2. Choose Instance Type, 3. Configure Instance, 4. Add Storage, 5. Add Tags, 6. Configure Security Group, and 7. Review. The main content area is titled 'Step 1: Choose an Amazon Machine Image (AMI)' with a 'Cancel and Exit' link. On the left, there is a sidebar with 'Quick Start' (My AMIs, AWS Marketplace, Community AMIs) and a 'Free tier only' filter. The main list shows two AMIs: 'Amazon Linux 2 AMI (HVM), SSD Volume Type' and 'Amazon Linux AMI 2018.03.0 (HVM), SSD Volume Type'. A red circle highlights the pagination control '1 to 36 of 36 AMIs' at the top right of the list.

EC2 Management Console

https://console.aws.amazon.com/ec2/v2/h...

aws Services Resource Groups

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Add Tags 6. Configure Security Group 7. Review

Step 1: Choose an Amazon Machine Image (AMI) Cancel and Exit

Quick Start

My AMIs

AWS Marketplace

Community AMIs

☐ Free tier only ⓘ

Amazon Linux Free tier eligible

Amazon Linux 2 AMI (HVM), SSD Volume Type - ami-0922553b7b0369273

Amazon Linux 2 comes with five years support. It provides Linux kernel 4.14 tuned for optimal performance on Amazon EC2, systemd 219, GCC 7.3, Glibc 2.26, Binutils 2.29.1, and the latest software packages through extras.

Root device type: ebs Virtualization type: hvm ENA Enabled: Yes

Select

64-bit

Amazon Linux Free tier eligible

Amazon Linux AMI 2018.03.0 (HVM), SSD Volume Type - ami-Off8a91507f77f867

The Amazon Linux AMI is an EBS-backed, AWS-supported image. The default image includes AWS command line tools, Python, Ruby, Perl,

Select

64-bit

1 to 36 of 36 AMIs

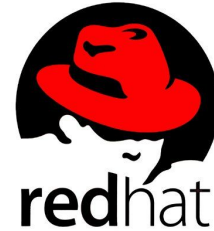
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Multi-distro Support



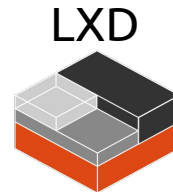
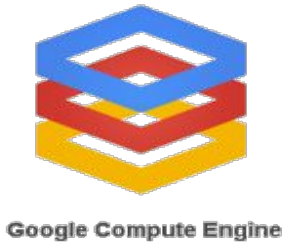
FreeBSD®



CentOS



gentoo linux



Cloud Init Goals

Never need to make a custom image or reboot.

- Execute code at defined points in boot:
 - asap, network-up, “final”

Support custom image via image capture workflow.

- Execute code on boot **once** (ever), per-**instance**, or per-**boot**.
- Boot your instance, modify things, snapshot, re-use.

Cloud Image migration.

OSes should have to only ship a single image.

Cloud Instance Makeup

Inputs to a cloud instance.

- Disk Image
- Meta-data
- User-data
- Vendor-data

Each cloud platform provides in different format in a different manner (disk, network, serial device ...)

Cloud-init *commonizes*.

Disk Image

Just a container for blocks.

How do you get one?

- Use Existing.
- Make your own.
- Download.

 <https://download.opensuse.org/repositories/Cloud:/Images/>

 <https://cdimage.debian.org/cdimage/openstack/>

 <https://cloud-images.ubuntu.com/>

 <https://alt.fedoraproject.org/cloud/>

Meta-data

- Information provided by the cloud platform
- Examples:
 - Hostname
 - Authorization information (ssh public keys)
 - Network information
 - Instance-id
 - Tags

Network Configuration

Initially network was simple: dhcp on eth0

Now clouds have multiple nics, multiple IPs, ipv4 and ipv6, bonds, bridges, vlan.

Each cloud describes network differently.

Cloud-init renders to OS specific network config:

- /etc/network/interfaces
- Netplan
- Sysconfig
- Arch, FreeBSD

User-data

Simple

```
#!/bin/sh  
echo Hi Mom
```

Fancier

```
#cloud-config  
packages: [pastebinit]  
runcmd:  
  - echo Hi Mom | tee /run/greeting.log | pastebinit
```

Vendor Data

User-Data Uses

Enable automation and integration.

Specific configuration language for:

Add Packages and Upgrade	Configure LXD
Set Hostname	Add Users and Groups
Add SSH Keys	Partition Disks
Run Arbitrary Code	Grow the root Partition
Start Puppet or Chef	Phone Home
Timezone / Locale	Mirror Selection

Handoff to existing Chef management

```
#cloud-config
chef:
  install_type: "omnibus"    # package|gems
  omnibus_version: "12.3.0"
  node_name: "your-node-name"
  server_url: "https://chef-server.you"
  environment: "production"
  run_list:
    - "recipe[apache2]"
    - "role[frontend]"
```



Handoff to existing Puppet management

```
#cloud-config
puppet:
  conf:
    agent:
      certname: whiz-bang-front-end.mydomain
      server: puppetmaster.mydomain
  ca_cert: |
    -----BEGIN CERTIFICATE----- ...
```



Handoff to existing SaltStack management

```
#cloud-config
salt_minion:
  conf:
    master: salt.example.com
  grains:
    role:
      - web
  public_key: |
    -----BEGIN PUBLIC KEY----- ...
  private_key: |
    -----BEGIN PRIVATE KEY----- ...
```



Cloud-init 18.4/18.5 features

- ☐ (18.4) Standardized instance metadata on all clouds and distros
`/run/cloud-init/instance-data.json`
- ☐ (18.4) Extended command line tooling
 - **cloud-id/cloud-init query:** emit specific instance-data attributes.
Report canonical cloud name and region
 - **cloud-init analyze :** detailed analysis of boot-time operations
 - **cloud-init status:** block until cloud-init successfully completes
- ☐ (18.5) Hotplug network configuration
 - Automatically apply network config based on metadata/udev events

Templates allow for one #cloud-config

```
## template: jinja
#cloud-config
{% set HN='oss-' ~ v1.platform ~ '-' ~ v1.region ~ '-' ~ range(9) |
random %}
puppet:
  conf:
    agent:
      server: puppetserver.blackboxsw.com
      certname: {{ HN }}
hostname: {{ HN }}
...
{% if v1.region == 'us-east-2' and v1.cloud_name == 'aws' -%}
echo 'Installing custom proxies ...'
{%- endif %}
```

Cloud-init at work [demo]

- Deploying puppet across clouds and Linux distributions
 - Live demo
- Standardized Instance-data available from cloud-init
 - <https://asciinema.org/a/208031>

Thanks, Questions, Contact

Thanks! Questions?

<https://cloud-init.io/>

<https://cloudinit.readthedocs.io/>

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