THE LINUX FOUNDATION
OPEN SOURCE SUMMIT
EUROPE

Cloud-init: The cross-cloud magic sauce.

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

THE LINUX FOUNDATION

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ubuntu

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

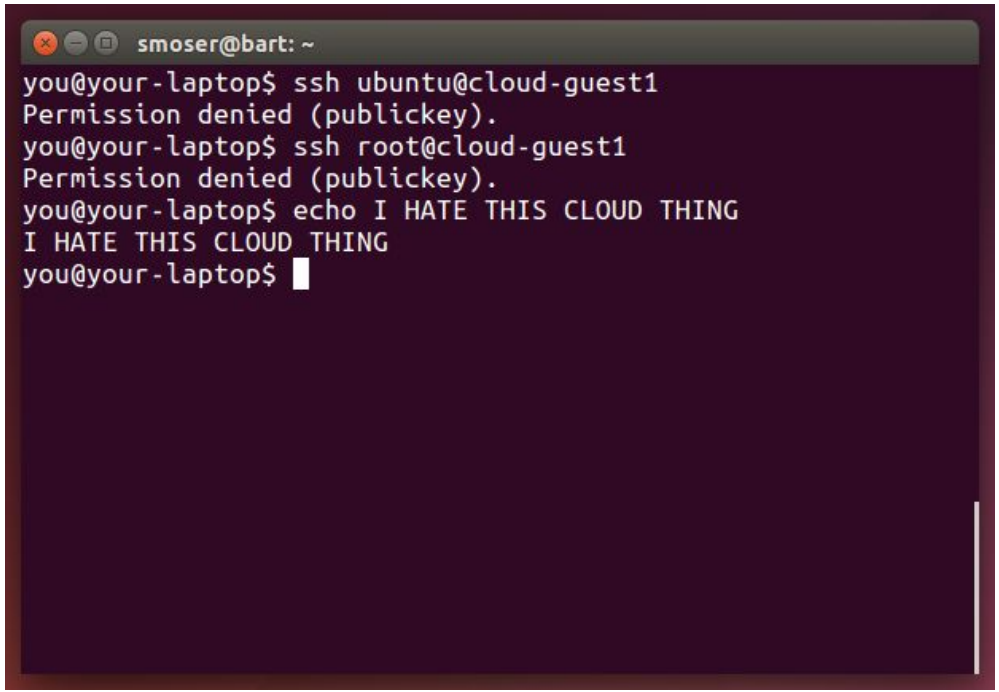
What is cloud-init?

Cloud Init is cross platform cloud instance initialization software.

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

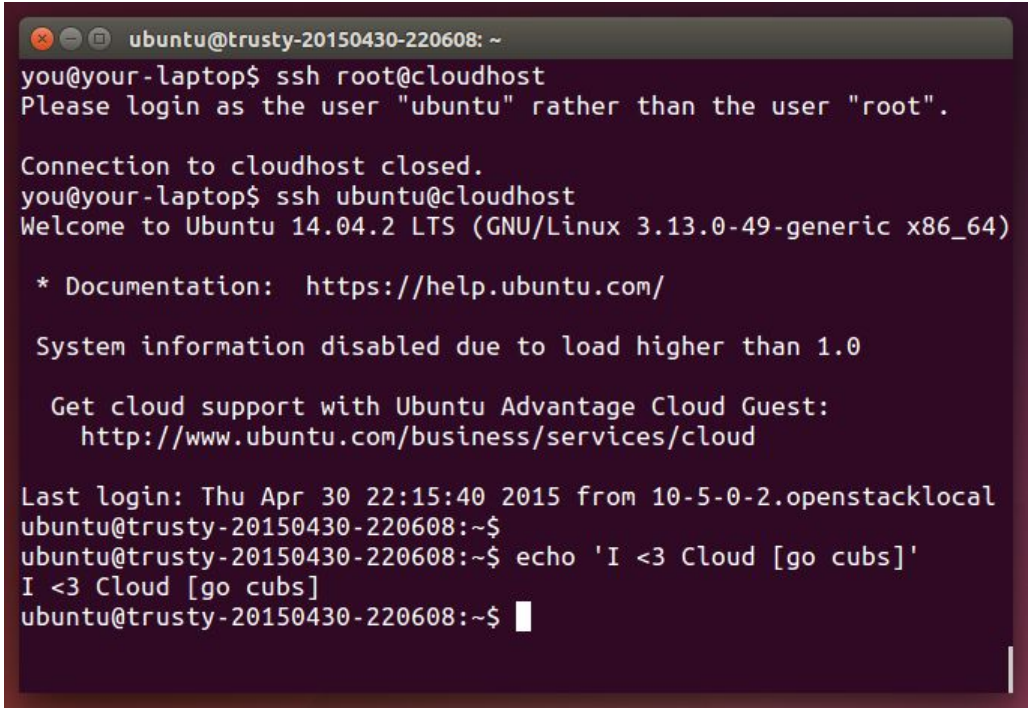
Why is cloud-init?

Basic instance initialization.

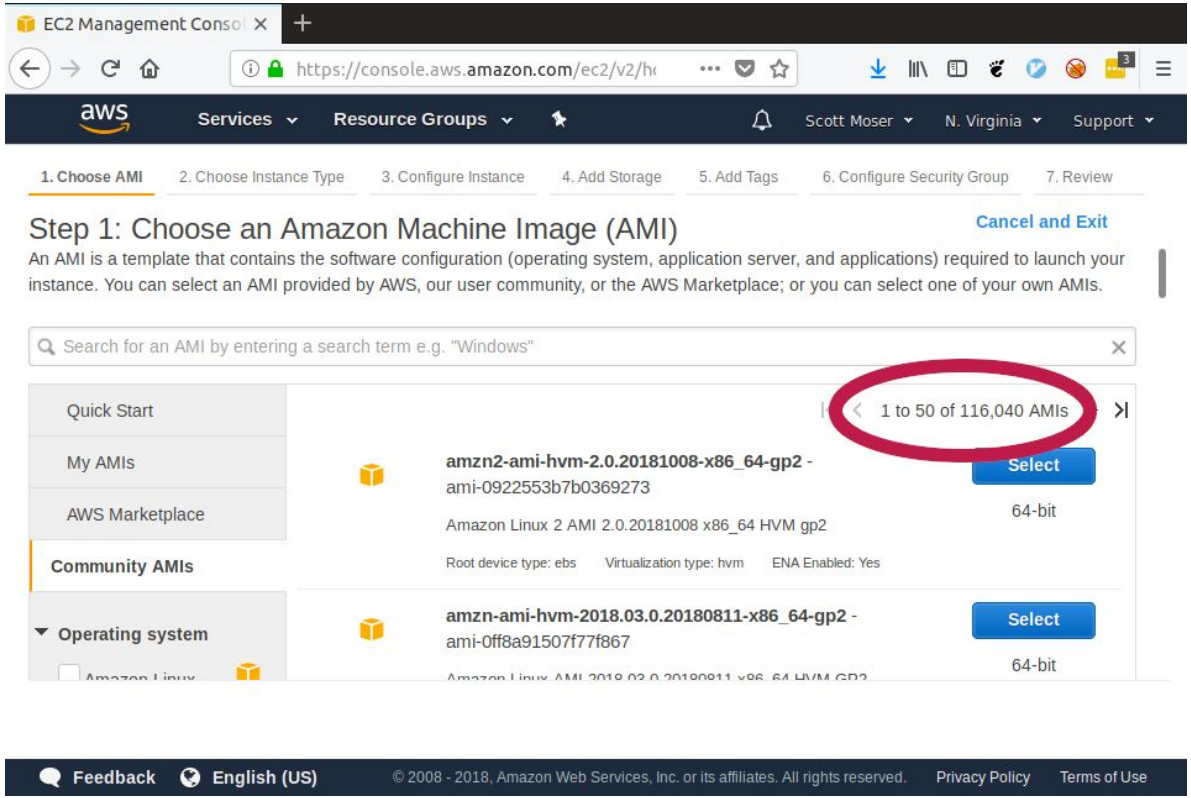


Why is cloud-init?

Ahh. That's better.



Turn This


EC2 Management Conso
https://console.aws.amazon.com/ec2/v2/h
aws
Services
Resource Groups
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Support
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
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
Root device type: ebs
Virtualization type: hvm
ENA Enabled: Yes
Select
64-bit
amzn-ami-hvm-2018.03.0.20180811-x86_64-gp2 - ami-0ff8a91507f77f867
Select
64-bit
Feedback
English (US)
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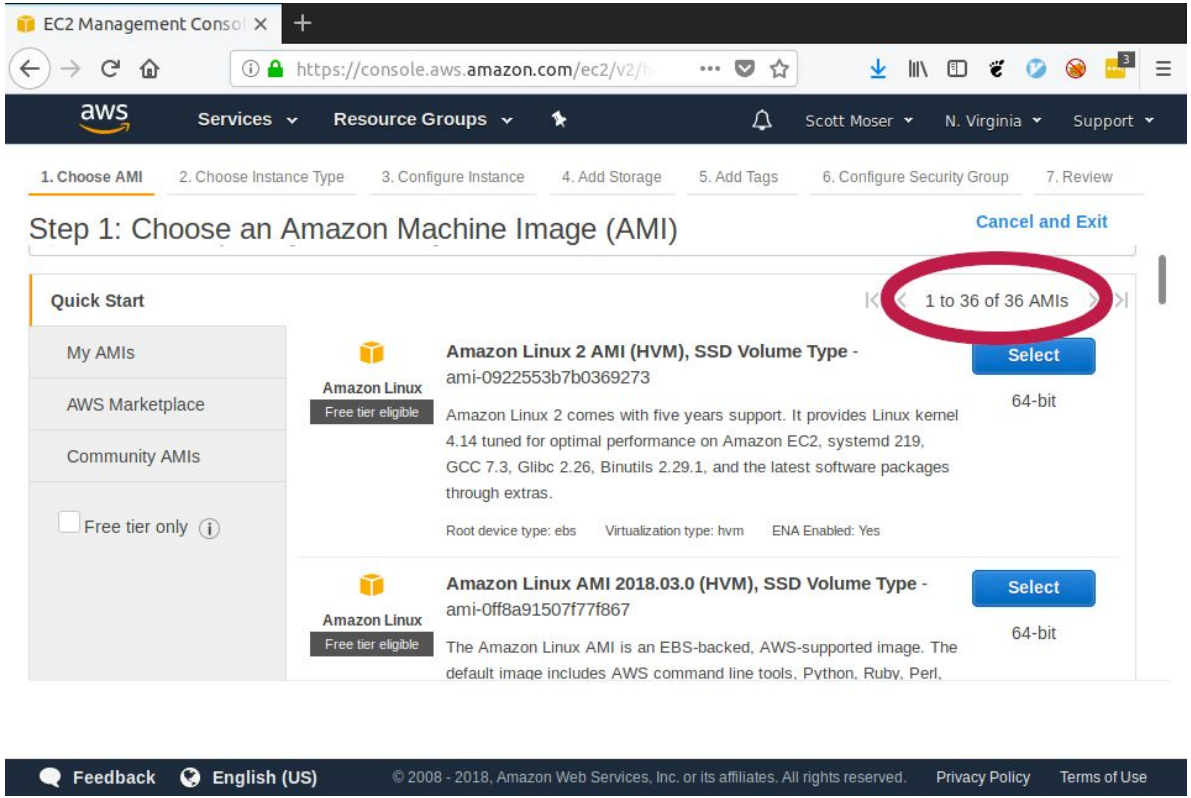
Into This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Step 1: Choose an Amazon Machine Image (AMI)
Cancel and Exit
Quick Start
1 to 36 of 36 AMIs
My AMIs
AWS Marketplace
Community AMIs
Free tier only
Amazon Linux
Free tier eligible
Amazon Linux 2 AMI (HVM), SSD Volume Type - ami-0922553b7b0369273
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-0ff8a91507f77f867
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
Feedback
English (US)
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suse
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FreeBSD
Multi-distro
Support
redhat
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gentoo linux


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MAAS
Google Compute Engine
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LXD
ORACLE CLOUD
Multi-cloud Support
openstack
HETZNER ONLINE
KVM
Joyent
CloudSigma
IBM Cloud
rackspace

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?

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smoser, blackboxsw
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