Ubuntu on Public Clouds

What, Where and Why?

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What we hope to understand

What is Ubuntu?

Is it any different on a public cloud?

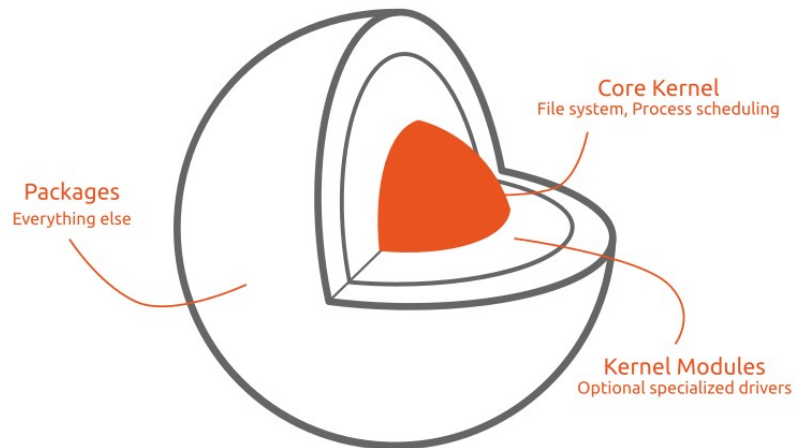How is it created?

Who helps create it?

What need does it serve?

What is an Ubuntu image?

An opinionated version of Linux

Contains the Linux kernel + packages

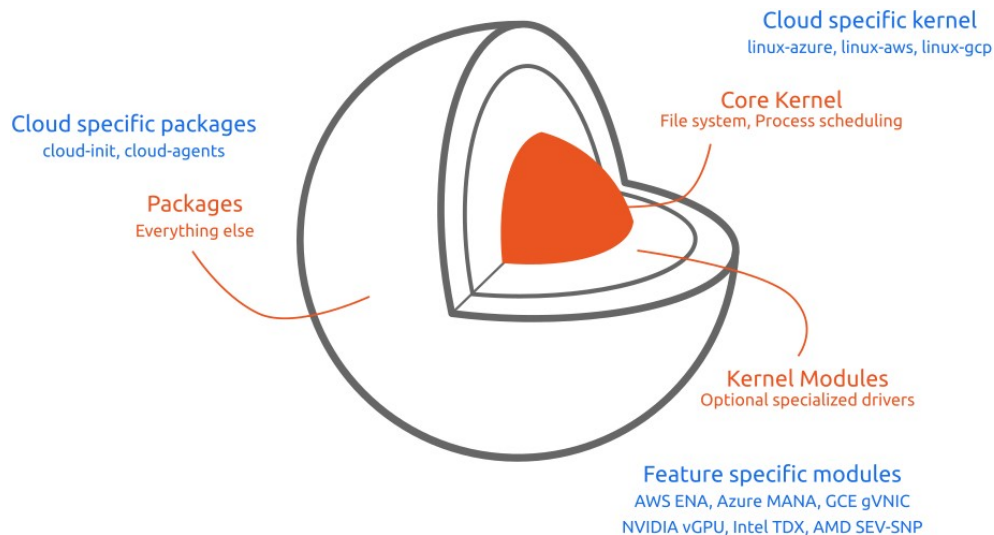Is a ready-to-launch OS
(no installation needed)

Core Kernel
File system, Process scheduling

Packages
Everything else

Kernel Modules
Optional specialized drivers

What is Ubuntu on Public Clouds?

Optimized Ubuntu images

Customized for each cloud

Include a cloud-specific kernel
and cloud-specific packages

Cloud specific kernel
linux-azure, linux-aws, linux-gcp

Cloud specific packages
cloud-init, cloud-agents

Core Kernel
File system, Process scheduling

Packages
Everything else

Kernel Modules
Optional specialized drivers

Feature specific modules
AWS ENA, Azure MANA, GCE gVNIC
NVIDIA vGPU, Intel TDX, AMD SEV-SNP

aws   Google Cloud   IBM Cloud   Microsoft Azure   ORACLE Cloud Infrastructure

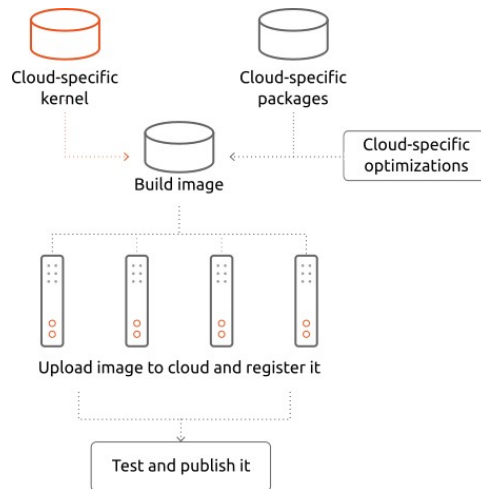# How are the images generated?

Download kernel + packages

Add cloud specific optimizations

Build the image

Upload it to the cloud

Test and publish it

Do this everyday!

How are the images generated?

Image variants (not versions)

Base, Minimal, Pro, Pro FIPS, Pro mini, Pro with RT Kernel,
Bare-metal, Specialized VDIs, K8s nodes, Appliances

Image release types
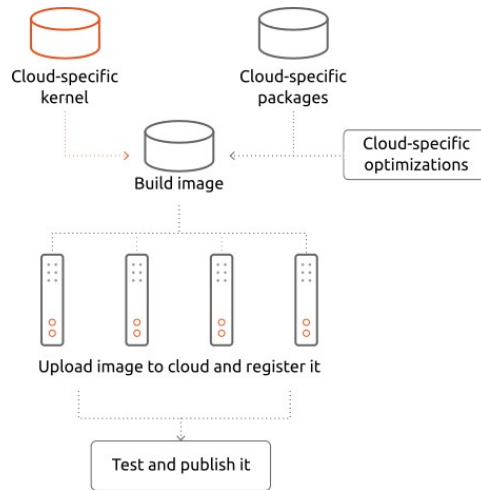
Dailies, Interim (6 months), LTS (2 yrs)

Packages in an image

Base – 426, Minimal – 288, K8s node – 470

~200 people involved

1500+ images delivered daily

Variants x release types x supported versions x clouds x regions

Cloud-specific kernel

Cloud-specific packages

Cloud-specific optimizations

Build image

Upload image to cloud and register it

Test and publish it

Collaborations

Cloud
Partners

Canonical

Operating System
(Software)

Cloud Infrastructure
(Hardware)

Silicon
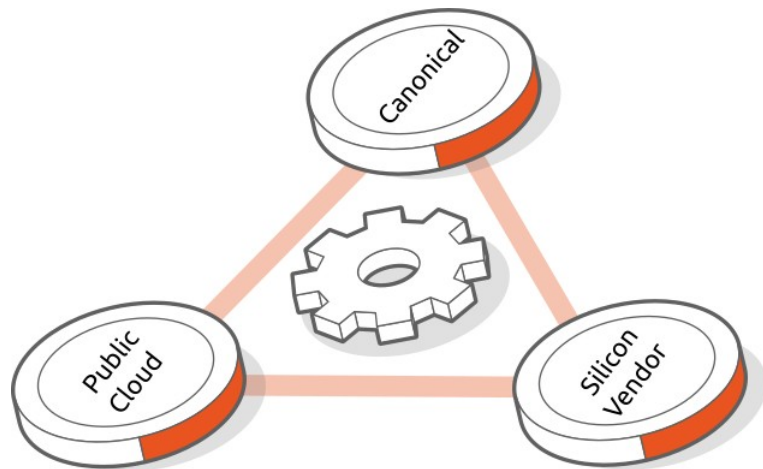Vendors

New feature support

Silicon vendor develops kernel patches

Canonical builds and signs a new linux-generic kernel based on the upstream kernel

Cloud partner tests it

Canonical converts it into a cloud-specific kernel (along with a feature flag to indicate availability)

Kernel: linux -> linux-generic -> linux-$CLOUD

Cloud partner collaboration requests

| REQUEST TYPE	EXAMPLE
Platform feature enablement	**Confidential computing**
Feature request	**Add gVNIC driver for accelerated networking** **Support NVIDIA GPU Driver for ARM Nodes**
Bug fix	**Debug kernel NULL pointer reference** **Manual driver installation fails**
Kernel patch	**Patch kernel vulnerability for CVE-2024-1234**
Customer issue	**Provide details about CIS hardening**

Partner Collaborations

Good end user experience

Ability to use all available features

Standardization of app deployment across VM, K8s containers, etc

| Public clouds | aws | Google Cloud | IBM Cloud | Microsoft Azure | ORACLE Cloud Infrastructure |
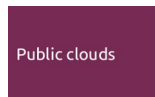
Engineering collaboration

Weekly meetings with various engineering teams belonging to the cloud partner

Aligned roadmaps (for new feature release)

| Silicon vendors | AMD | arm | intel. | NVIDIA | Qualcomm |
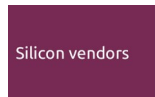
Testing & quality initiatives

Automated testing by both Canonical and cloud partners

Needs of a software

Software	Program	Desktop software	SAAS (On cloud)

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Needs	Desktop with toolchains	Containers, Microservices	Scalability, High availabilty, Maintainability	Security, Confidentiality	ML workflows	Compliance

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Solution?	Ubuntu desktop		Ubuntu on Public Cloud			

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Security & maintainability

Most of the code used in an image is available

GitHub, Launchpad, ..

Anyone can file an issue / pull request
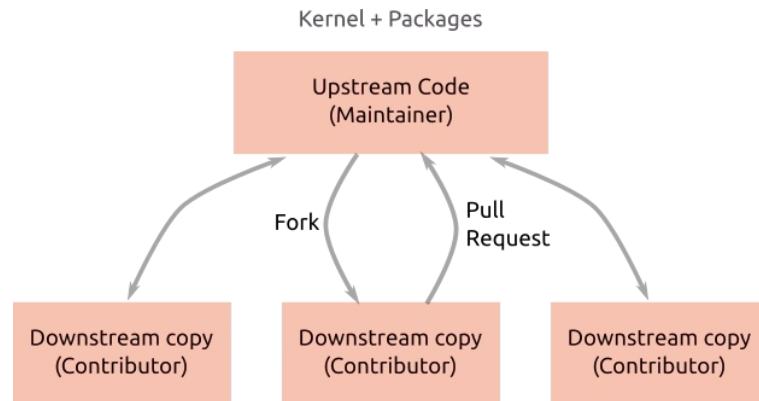
Maintainer will make the update

Update: New feature, bug fix, kernel patch

Security: Use the latest version

Regular (daily!) syncing to ensure security

Maintainability: Updates are backported to older versions

In LTS and Pro versions updates are backported for over 25000 packages

Kernel + Packages

Upstream Code
(Maintainer)

Fork

Pull
Request

Downstream copy
(Contributor)

Downstream copy
(Contributor)

Downstream copy
(Contributor)

Other needs

Containers, Scalability, HA, ML

Clouds provide infrastructure and use ubuntu-based images

E.g. K8s clusters, AWS ENA, Google gVNIC, AI/ML stacks, vGPUs

Confidentiality

Silicon vendors enable confidential computing
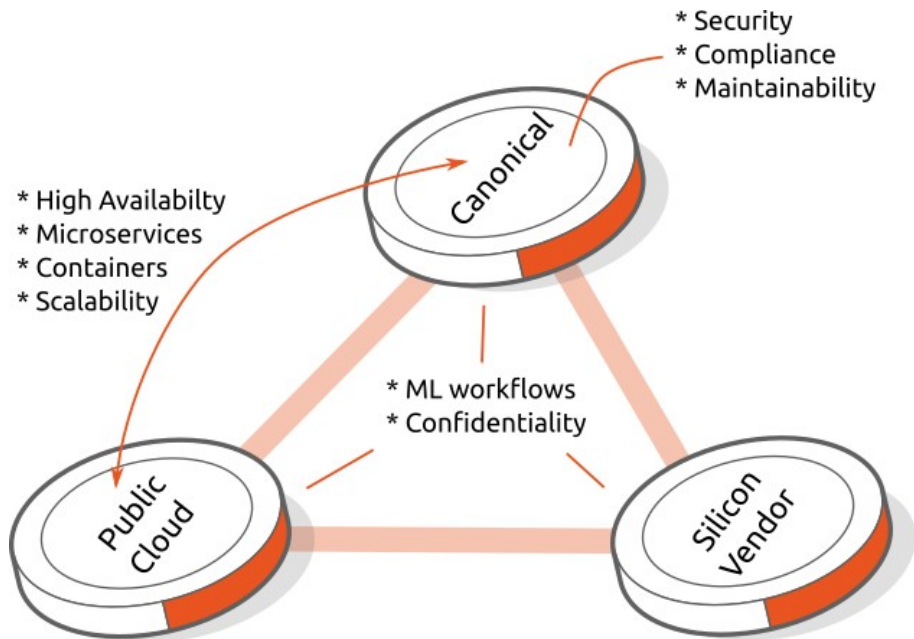
E.g. Intel TDX, AMD SEV-SNP

Compliance

Canonical creates images that are FIPS enabled and CIS / DISA-STIG hardened

Are all the needs met?

* Security
* Compliance
* Maintainability

* High Availabilty
* Microservices
* Containers
* Scalability

Canonical

* ML workflows
* Confidentiality

Public Cloud

Silicon Vendor

Containers, Microservices	Scalability, High availabilty, Maintainability	Security, Confidentiality	ML workflows	Compliance
Ubuntu on Public Cloud				

In effect ..

Ubuntu on Public Clouds is :

        * a set of optimized Ubuntu images

        * built in collaboration with multiple entities

        * that caters to a variety of customer needs

Thank you! Questions?