

Desktop Linux as easy as a smartphone – **Just in a Snap!**

An introduction into the universal packaging format

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Your application everywhere, just in a Snap!

What the hell are Snaps? And why should I use them?

What the hell are Snaps?

- App developers provide apps as **source code**
 - Only **tech-savvy users** can use it directly
 - They need **goodwill of distro maintainers** to get their app packaged
 - Or **they package their app**, for 10+ distros and have to test on 10+ distros
- **That is a nightmare! Isn't it?**

What the hell are Snaps?

- You have a **smartphone**? There it is much easier: **Google Play Store, App Store**
 - And remember that Canonical developed a **smartphone OS**?
 - They have **learned** from it!
- ⇒ And now we have ...

Snap!

By the way, **Snap got 10 years old!**

What the hell are Snaps?

- **Sandboxed packaging**
- **OS-distribution-independent**
 - You package and test once, put your **Snap** into the **Snap Store**, and users of **any distro** (Ubuntu, Debian, SUSE, Red Hat, Windows, ...) can use it.
 - **All libraries and other dependencies** come with your Snap
- Your app runs in a **security shell** isolated from the host system
 - Communication to outside only via **well-defined interfaces**
 - **Snap Store has control**, has to explicitly permit "dangerous" interfaces
 - This way we can **trust third-party apps**
 - We are not dependent any more on distro maintainers for secure packages
- **User experience as with smartphone apps**

What the hell are Snaps?

- **Don't fear the daemons, we snap them, too!**

- Snap is universal, not only desktop apps but also daemons, system utilities, sub-systems, drivers, operating system cores, kernels, ... can get snapped
=> **All-Snap operating system**, like **Ubuntu Core Desktop**

- **Packaging moves from distros to upstream**

- 10+ distros, each packaging XXX, inventing the wheel 10+ times
- So let upstream, XXX.org, snap it, distros take the Snap
- Distro version released, app updates continue from upstream

- **Immutable distros, Immutable sub-systems, Immutable apps**

- Ubuntu Core: **Immutable core**, all-Snap distro, desktop under development
- Snaps are **immutable apps** (or **immutable sub-systems**, like the CUPS Snap)

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Snap Packages

Snap Package Properties

- Compressed and **GPG-signed read-only squashfs images**
- Includes **metadata** in a ***.yaml** file
- Installed Snap has a **writable file system area** inside its confinement
- Come in **5 types** (app, os core, gadget, kernel, desktop session)
- Support **transactional (atomic) updates** and **rollback**
- Can handle **binary diffs** for smaller download on upgrades
- **Available on multiple distros** and supported by default on all Ubuntu installs since Ubuntu 14.04 (**10 years!!**)

Snap Package Security

- **Read-only** file system image (squashfs)
- **GPG signed**
- **Confinement via:**
 - **AppArmor** (File system access rules)
 - **seccomp** (System call restrictions)
 - **Namespaces** (Separate resource spaces: PIDs, users, network, ...)
- **snapped** and **snap-confine** wrap around all executables in a snap, to ensure only the allowed writable dirs can be accessed

Snap Package Security

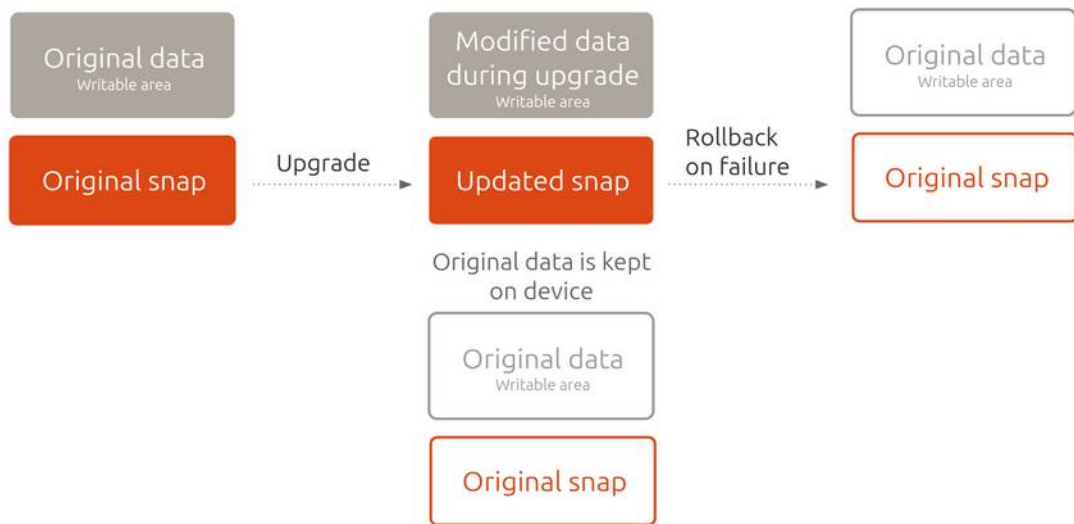
- **“root-safe”**
 - Applications can **run as root** but can not break out of the package confinement, **no need for specific user or group setup** to maintain security.
 - Example: **Daemon Snaps**
- **Storage-efficient**
 - Image stays compressed after install
 - **Core Snaps** and **content provider Snaps** hold common libraries and data files

Interfaces: Safe vs. Dangerous

- Snapped applications are **completely encapsulated** (AppArmor, seccomp, namespaces)
- By default, they cannot communicate with the host system or with other Snaps
- Communication is possible via **well-defined interfaces**: "network", "cups", "dbus", ...
- A "**plug**" has to be connected with a "**slot**" of the system or of another Snap in order to communicate
 - "**Safe**" interfaces
 - Ex.: "cups" which allows listing available printers and printing
 - **are auto-connected** when installing from Snap Store
 - "**Dangerous**" interfaces
 - Ex.: "cups-control" which allows creating/removing printers, delete all jobs ...
 - **need manual connection** or **permission** from Snap Store team for auto-connection

Updating Snaps

- Transactional (atomic) updates
- Current version and its writable area saved, for rollback
- Automatic rollback and reboot after kernel panic or boot failure

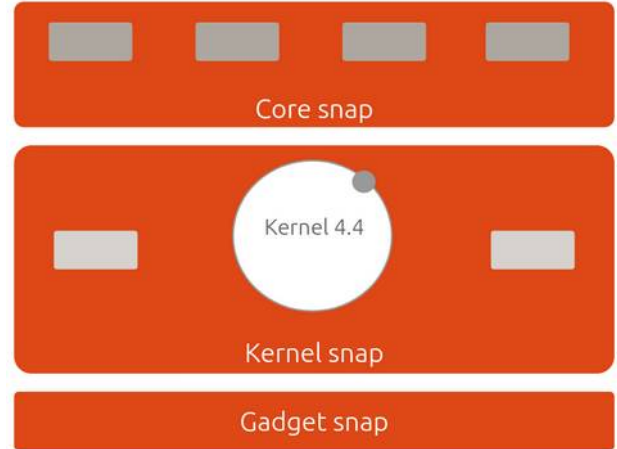


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Ubuntu Core – all-Snap OS

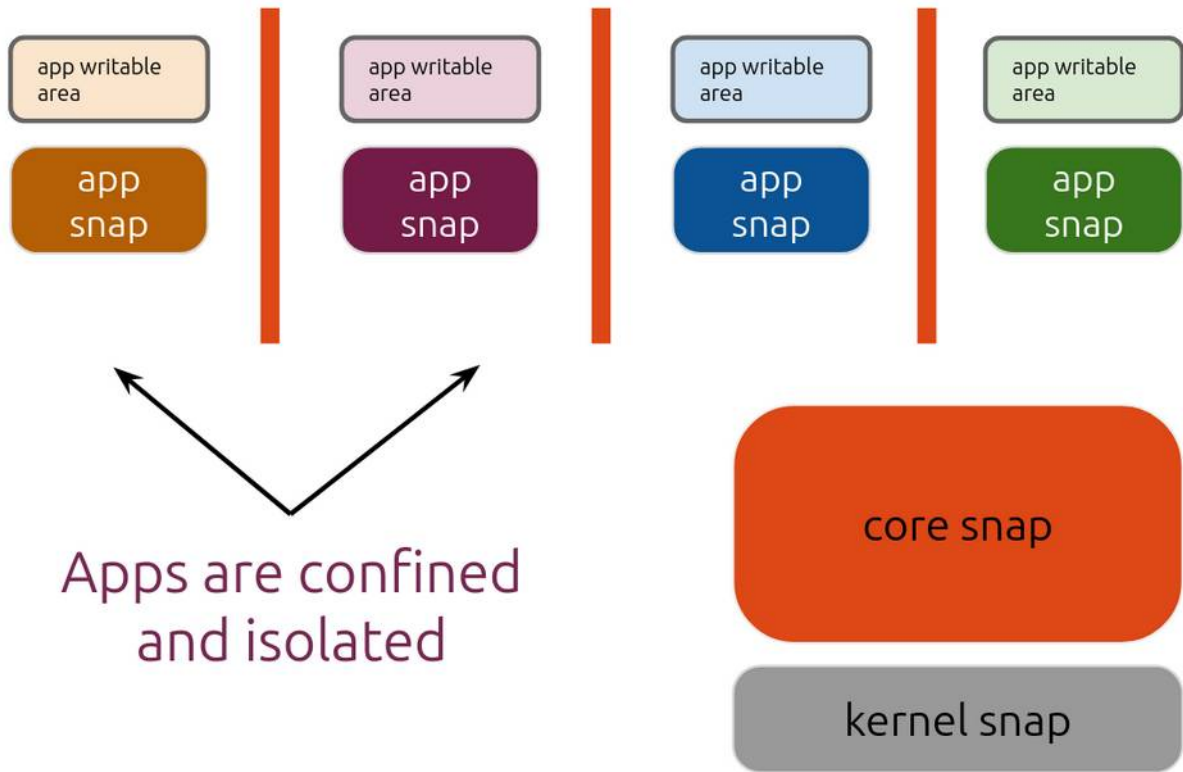
Ubuntu Core Operating System

- Originally created for IoT ...
- The all-Snap Ubuntu Core OS consists of
 - **Gadget Snap**
 - Bootloader, partitioning, hardware specifics ...
 - **Kernel Snap**
 - **Core Snap**
 - Minimum base operating system
 - core, core18, core20, core22, ... based on Ubuntu LTS
- Comes in one image but Snaps separately updateable



No interdependencies between Snaps

- Every Snap can be **independently** updated (and rolled back)



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Ubuntu Core Desktop

Ubuntu Core Desktop – Building Blocks

- **Easy to maintain** for end users, like a smartphone
- **Boot Base** = Core Snap
- **Additional Bases:** Extra Core Snaps needed for Apps using other coreXX base Snap
- **Ubuntu Desktop Session Snap:** Wayland, Desktop environment (GNOME)
- All building blocks **independently updateable** and **exchangeable**



Ubuntu Core Desktop

- **Principally as Ubuntu Core**, but image comes with
 - **Desktop Session Snap**
 - Common **Applications**
- **Development in LXD containers**, with GUI frontend **Workshops**
- Everything **easily** exchangeable: Other desktop, gaming kernel, ...

Ubuntu Core Desktop

- **Still to be done for release**
 - Gaming: **Nvidia driver** support
 - Productivity: **Printer setup tools** for all-IPP and Printer Application support
 - Productivity: **Scanner Applications**
 - Development: IDE support, GUI DEBs, classic Snaps
 - **TPM full disk encryption**
 - **Remote management** via Canonical Landscape
 - **Active Directory** login
 - Distro infrastructure: ISOs, testing, stable release tracks, documentation

Ubuntu Core Desktop

- **Advantages**

- **Stability:** Read-only system files, atomic updates, no dependency conflicts
- **Security:** Secure boot, read-only system files, encapsulation
- **Composability:** Defined modules which do not affect each other
- **Manageability:** Defined modules, atomic updates, single package format
- **Privacy:** Encapsulated apps with well-defined permissions

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The Making of ...

snapcraft – Let's go snapping ...

- **snapcraft** creates Snaps, orchestrating disparate components and building systems into one cohesive **distributable package**
- It can **re-use DEB packages** from Ubuntu (of the Ubuntu LTS release the Core Snap used is based on).
- It's **extensible** and new **plugins** to leverage different technologies are being developed all the time. A few examples of its plugins are Java, Python, Catkin (ROS), Go, CMake, qmake, make, autotools, etc.

snapcraft – Let's go snapping ...

- **Single snapcraft .yaml file** that describes everything
- Defines apps, build process, build dependencies, runtime dependencies, interfaces
- Fully supported and integrated in **Launchpad**
- GitHub build service provided via <https://build.snapcraft.io/>
- **Detailed documentation** and tutorials at <https://snapcraft.io/>

ubuntu-image – Assemble your all-Snap OS!

- The **magic tool** putting everything together
- Using a signed “assertion” file to define which Snaps end up inside the image
- Reads **gadget.yaml** to create **partitioning**
- Can build full disk images (i.e. SD card) or multi-partition images (i.e. to dd single img files to specific eMMC partitions on a pre-partitioned flash device)
- Available as a Snap! (**snap install ubuntu-image ...**)
- Detailed **documentation** at:
<https://docs.ubuntu.com/core/en/guides/build-device/image-building>

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Want to know more?

More info/links:

- Snap Store and home page of Snap:
 - <https://snapcraft.io>
- Discuss your questions in the forums:
 - <https://forum.snapcraft.io/>
- Documentation:
 - <https://snapcraft.io/docs>

More info/links:

- Learn about immutable OS distributions:
 - <https://ubuntu.com/blog/ubuntu-core-an-immutable-linux-desktop>
- Ubuntu Core Desktop – Introduction
 - <https://discourse.ubuntu.com/t/ubuntu-core-desktop-deep-dive/>
- Ubuntu Core Desktop – GitHub
 - <https://github.com/canonical/ubuntu-core-desktop/>
- Ubuntu Core Desktop – Installation HOWTO
 - <https://www.omgubuntu.co.uk/2023/06/try-ubuntu-snap-desktop>
- Ubuntu Core Desktop – Talk on Ubuntu Summit 2023
 - <https://www.youtube.com/watch?v=ahWrhnjjYDk>

More info/links:

- Ubuntu blogs from Oliver Smith about **optimizing performance of Snaps**:
 - <https://ubuntu.com/blog/how-are-we-improving-firefox-snap-performance-part-1>
 - <https://ubuntu.com/blog/how-are-we-improving-firefox-snap-performance-part-2>
 - <https://ubuntu.com/blog/improving-firefox-snap-performance-part-3>
 - <https://ubuntu.com/blog/firefox-snap-updates-and-upgrades>
- Want to watch some **snappy videos**? Here we go:
 - <https://www.youtube.com/watch?v=TfB6QwR2GYg>
 - <https://www.youtube.com/watch?v=ido6kGmSHWI>
 - <https://www.youtube.com/watch?v=m5QKJH9tDjQ>
- **Want to learn snapping? Here are my 3 workshops**:
 - <https://openprinting.github.io/OpenPrinting-News-November-2023/#snap-workshops>