Bad UX is Bad Security

Adventures in Qubes OS UX Design

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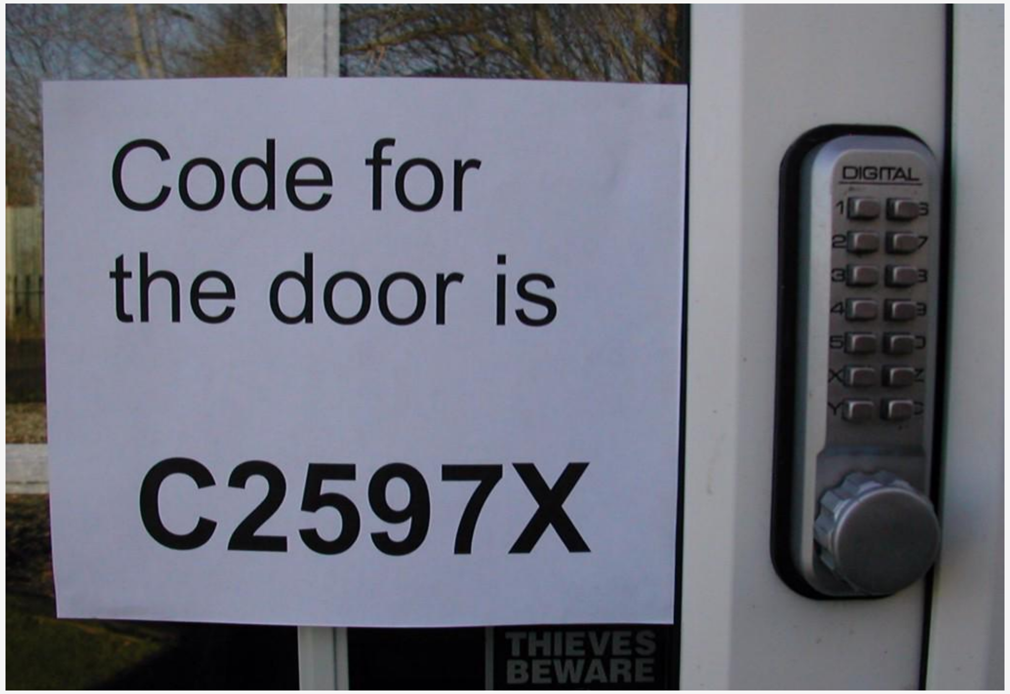
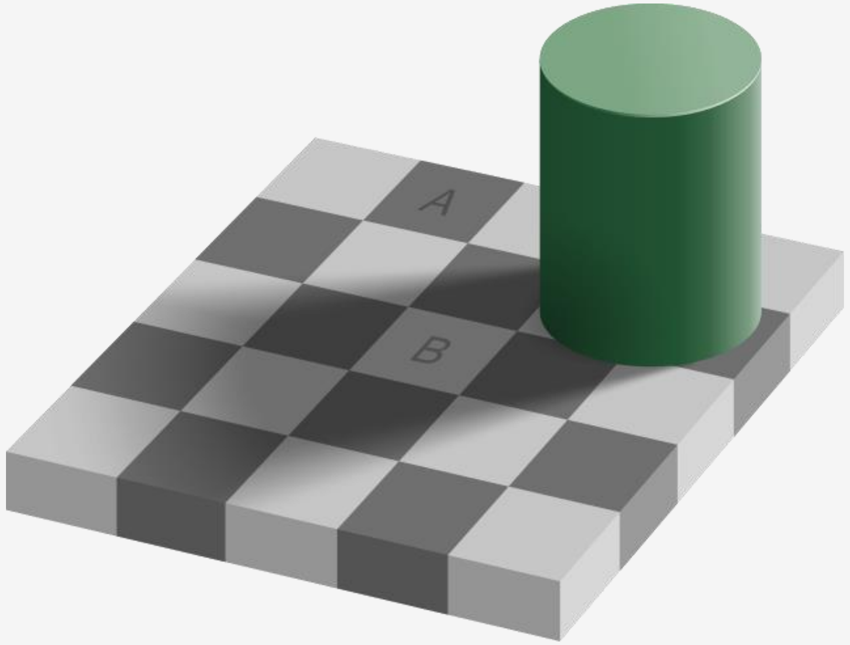
Why UX matters for security?

- Theoretical security vs practical security
- It doesn’t matter whose fault it is – the harm is done
- User errors are a real and important vector of attack
- Treat users seriously, not like children who need to behave better



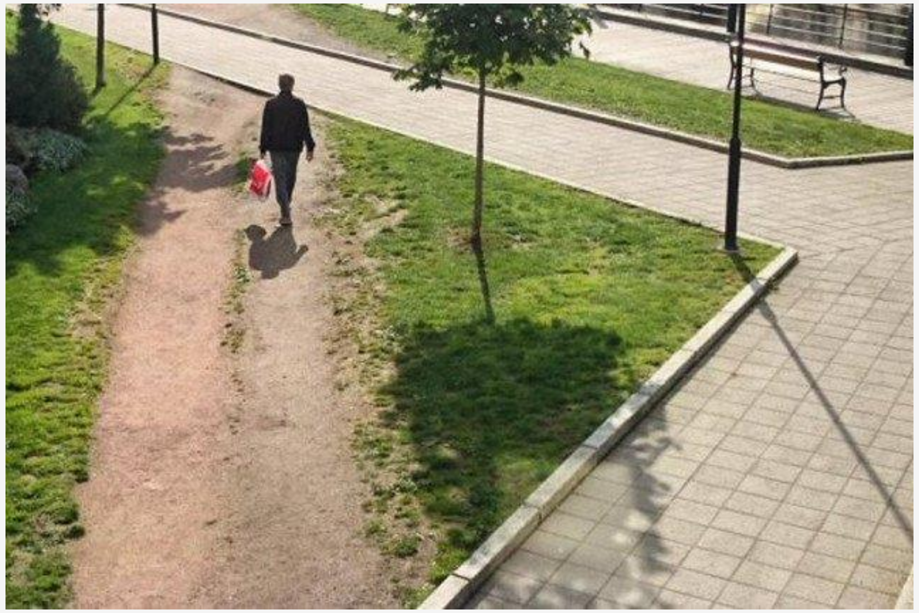
The Human Factor



- Humans make mistakes
- Humans might have other priorities than using the software perfectly
- Human brains are not optimized for the kind of tasks we want them to do with computers

Shortcuts

- If people keep using a shortcut, there's a need that has to be fulfilled
- The goal of doing a thing with a computer is rarely "do security" – security is a desired trait, but not goal in and of itself



Mistakes

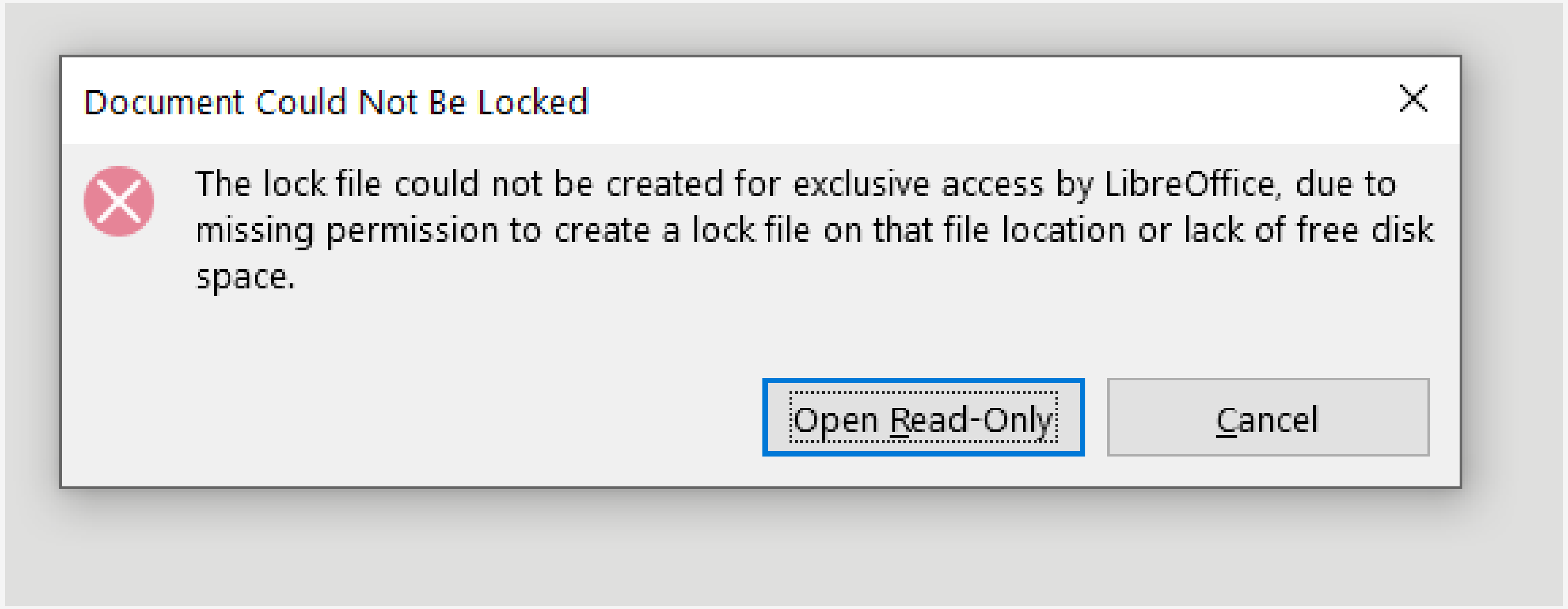
- People make mistakes and will always make mistakes
- Even the smartest person in the room can be in a hurry

The Problem of Attention

- Inattentional blindness: we only notice the things we care about
- Cocktail party phenomenon – this is generally a good thing for humans, but annoying for developers and designers

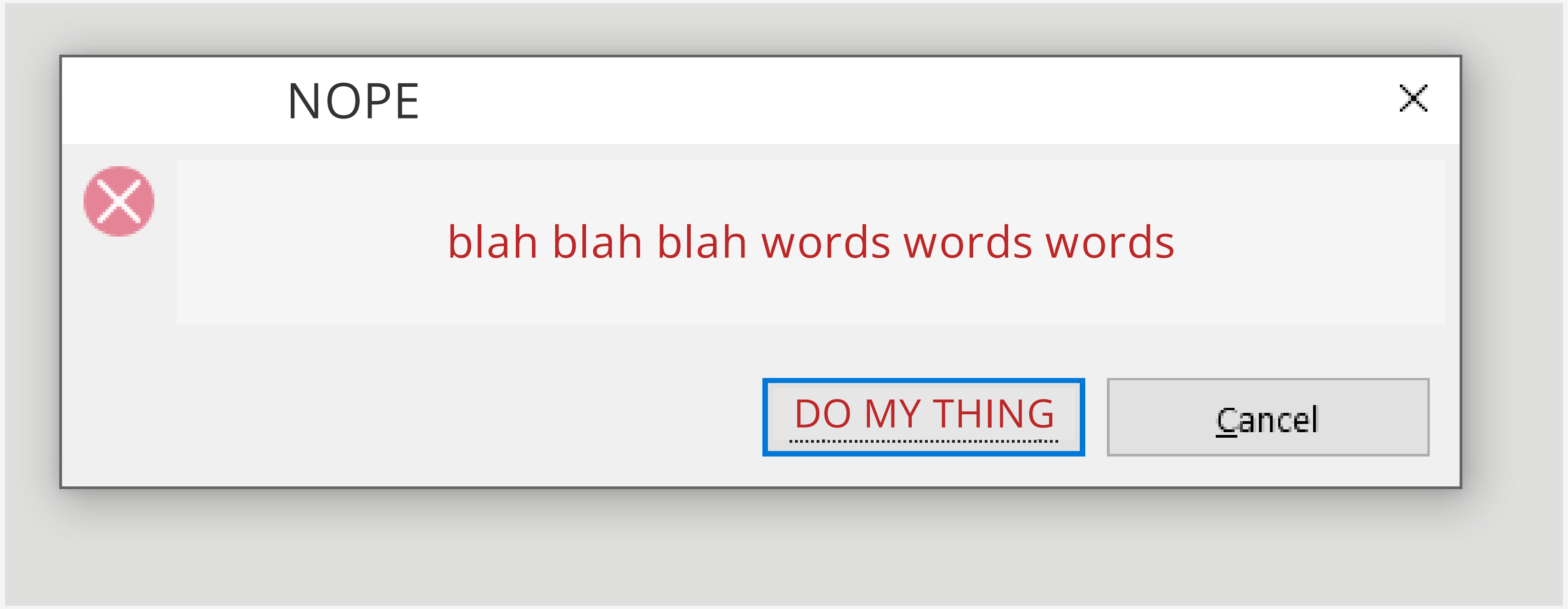
The Invisible Gorilla

The Invisible Error Message


Document Could Not Be Locked

The lock file could not be created for exclusive access by LibreOffice, due to missing permission to create a lock file on that file location or lack of free disk space.

The Invisible Error Message



blah blah blah words words words

What is Qubes OS?

- A meta-operating system
- Security through compartmentalization: instead of running everything together, the system is partitioned into isolated virtual machines called *qubes*
- Basically: bunch of virtual machines in a fancy comfortable trenchcoat

QUBES OS

A REASONABLY SECURE OPERATING SYSTEM

Qubes OS: Simplified Introduction

fedora template

serves as a base for other qubes

debian template

serves as a base for other qubes

sys-usb

holds all USB devices

sys-net

deals with networking devices

sys-firewall

handles firewall rules

system qubes

work

various work-related programs

social-media

browser & image editing

email

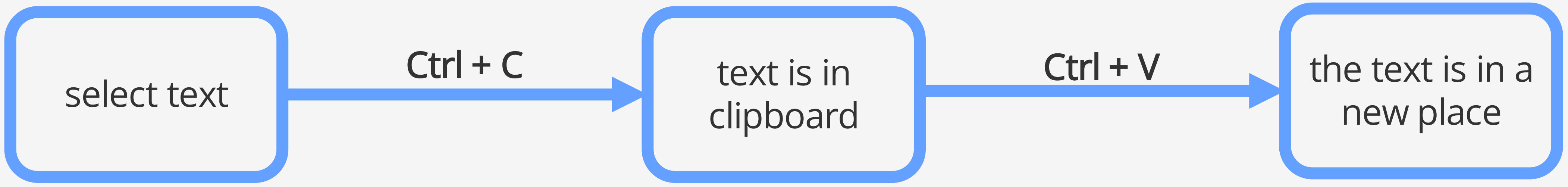
browser & mail

disposable

browser, this qube vanishes after use

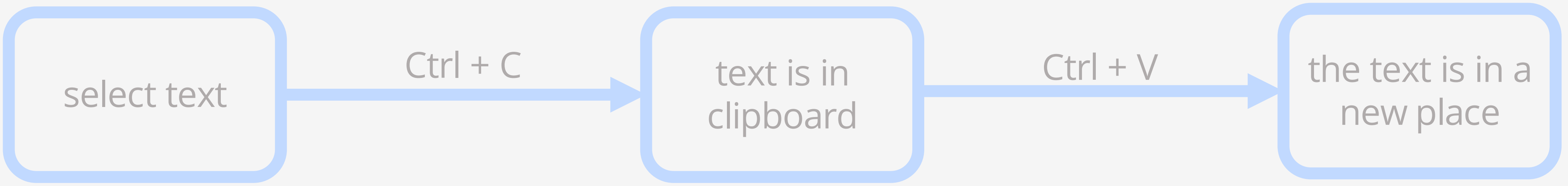
user qubes

Case study: Qubes OS copy and paste

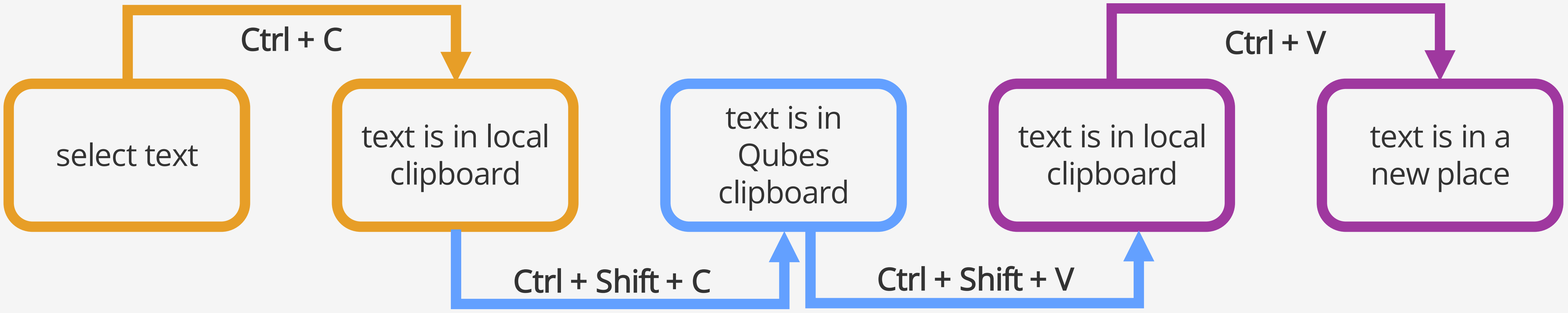


Normal Linux/Windows copy-paste

Case study: Qubes OS copy and paste



Normal Linux/Windows copy-paste

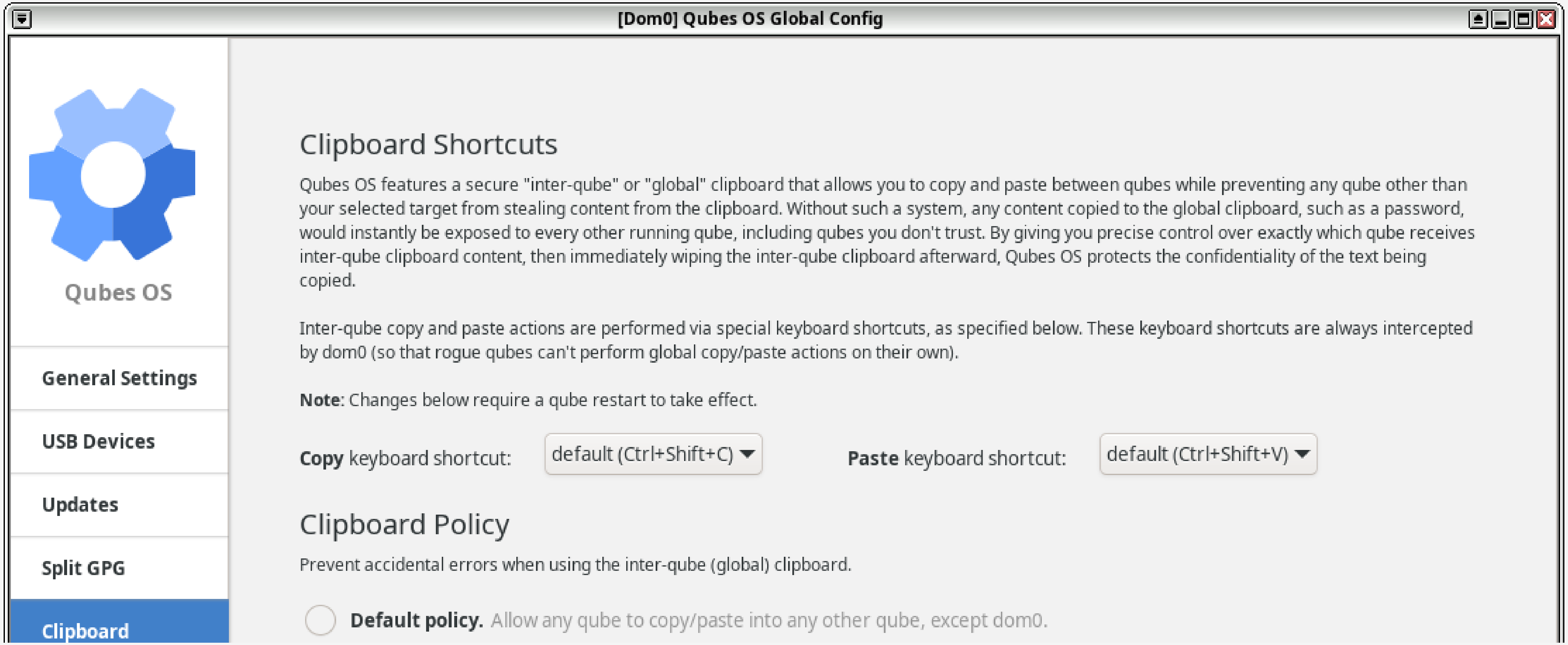


Qubes OS copy-paste

Case study: copy and paste

- Not perfect: people do get used to the extra step and it becomes nearly as automatic as the default
- But this workflow protects against things like clipboard stealing
- Further security is of course still necessary, thus: policy

Case study: copy and paste



Clipboard Shortcuts

Qubes OS features a secure "inter-qube" or "global" clipboard that allows you to copy and paste between qubes while preventing any qube other than your selected target from stealing content from the clipboard. Without such a system, any content copied to the global clipboard, such as a password, would instantly be exposed to every other running qube, including qubes you don't trust. By giving you precise control over exactly which qube receives inter-qube clipboard content, then immediately wiping the inter-qube clipboard afterward, Qubes OS protects the confidentiality of the text being copied.

Inter-qube copy and paste actions are performed via special keyboard shortcuts, as specified below. These keyboard shortcuts are always intercepted by dom0 (so that rogue qubes can't perform global copy/paste actions on their own).

Note: Changes below require a qube restart to take effect.

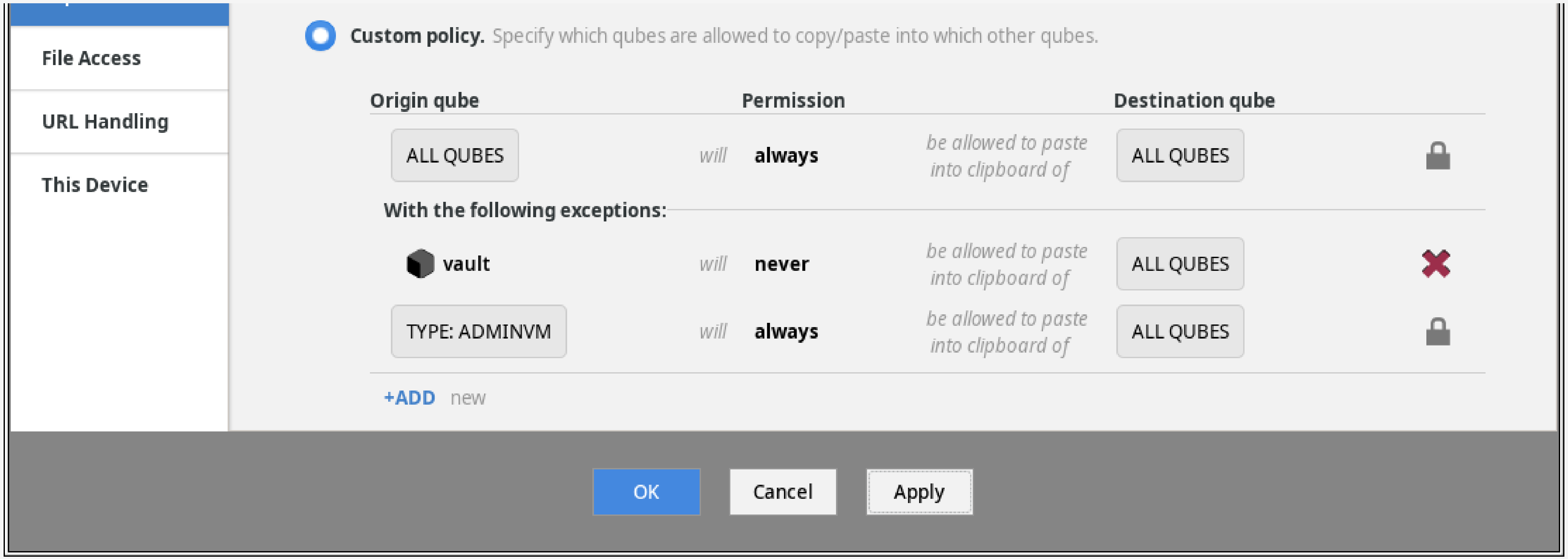
Copy keyboard shortcut: default (Ctrl+Shift+C)   **Paste** keyboard shortcut: default (Ctrl+Shift+V)

Clipboard Policy

Prevent accidental errors when using the inter-qube (global) clipboard.

○ **Default policy.** Allow any qube to copy/paste into any other qube, except dom0.

Case study: copy and paste



Custom policy. Specify which qubes are allowed to copy/paste into which other qubes.

Origin qube		Permission		Destination qube	
ALL QUBES	*will*	**always**	*be allowed to paste into clipboard of*	ALL QUBES	🔒

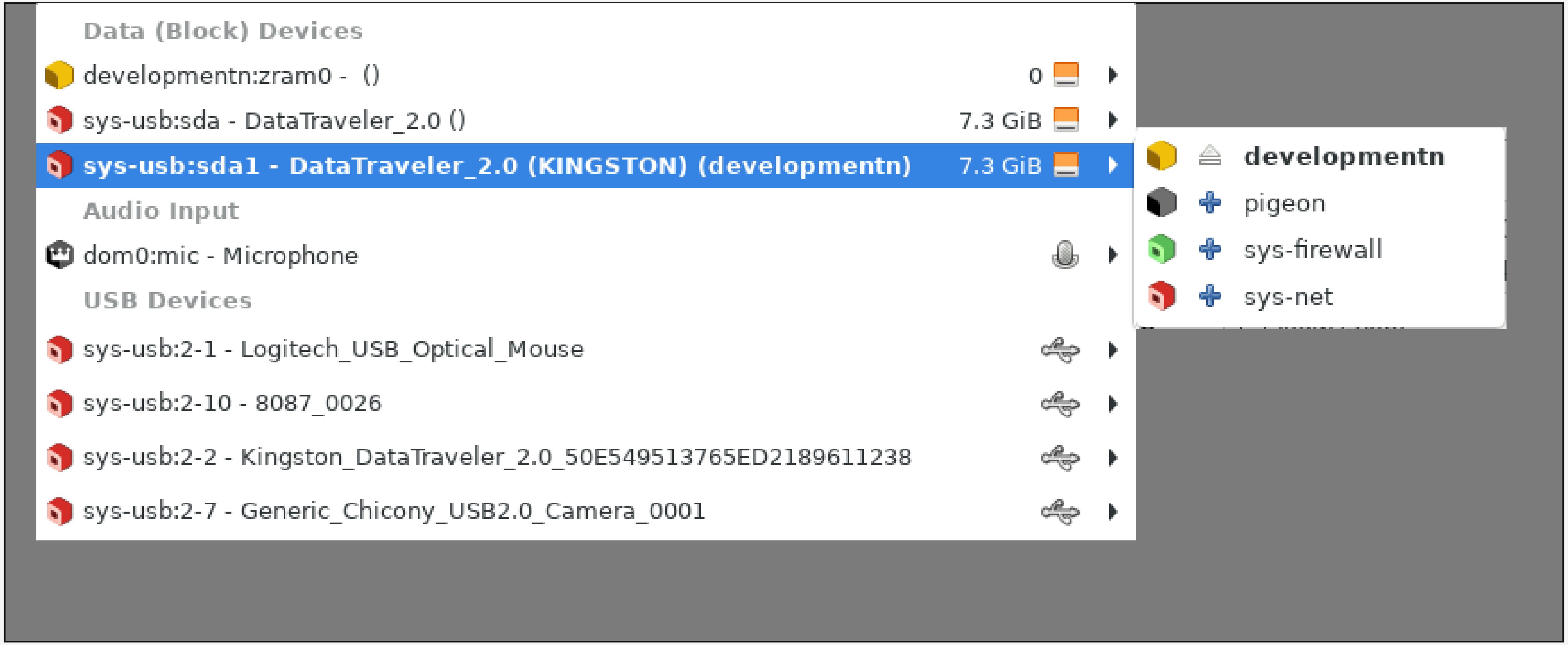
With the following exceptions:

vault	*will*	**never**	*be allowed to paste into clipboard of*	ALL QUBES	✗
TYPE: ADMINVM	*will*	**always**	*be allowed to paste into clipboard of*	ALL QUBES	🔒

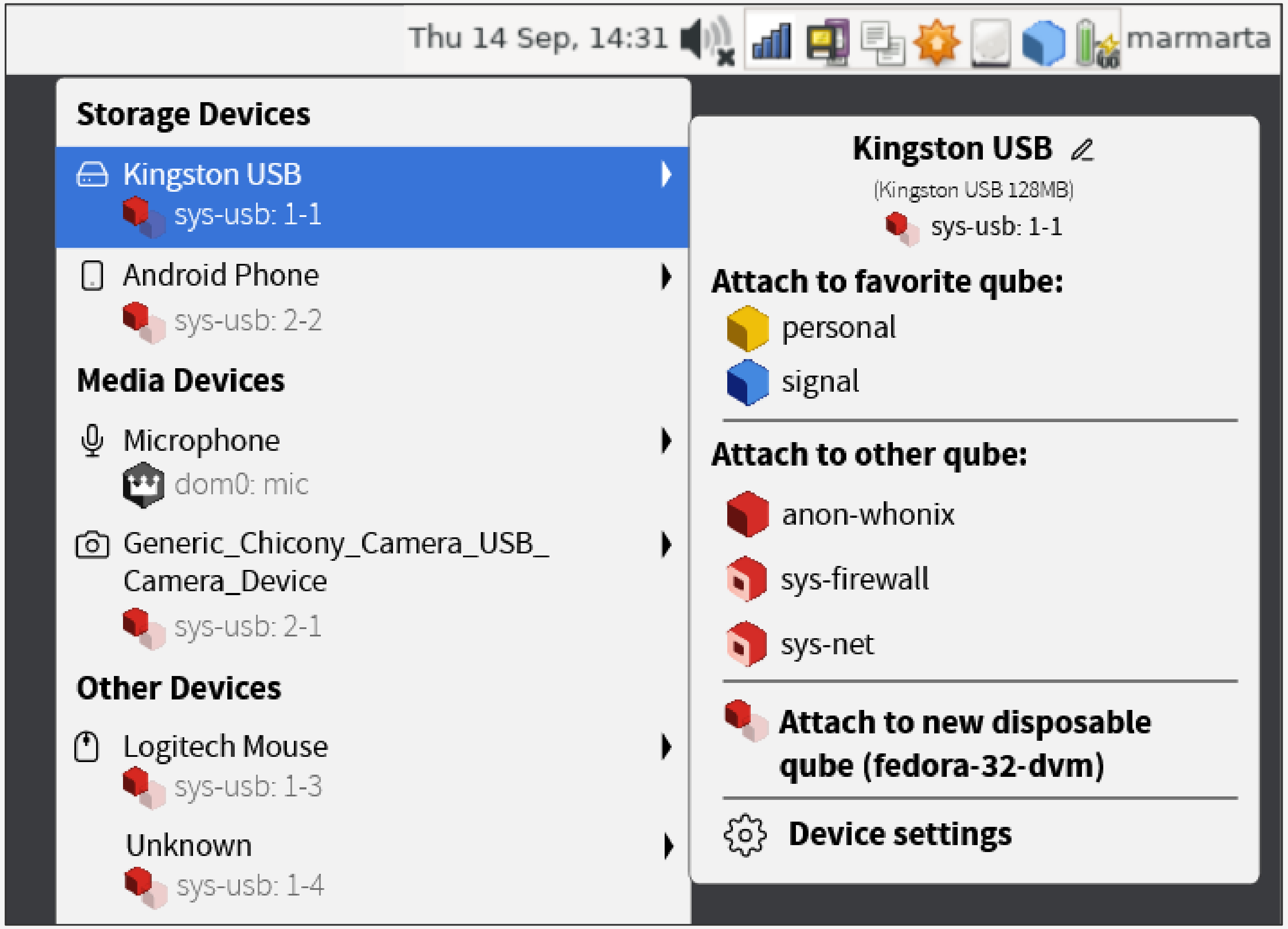
Case study: devices

- The problem: devices are evil
- And when they are not evil, they definitely can do too much (see: microphone and camera)
- Qubes OS isolates devices in their own qube and allows the user to connect them as needed to other qubes

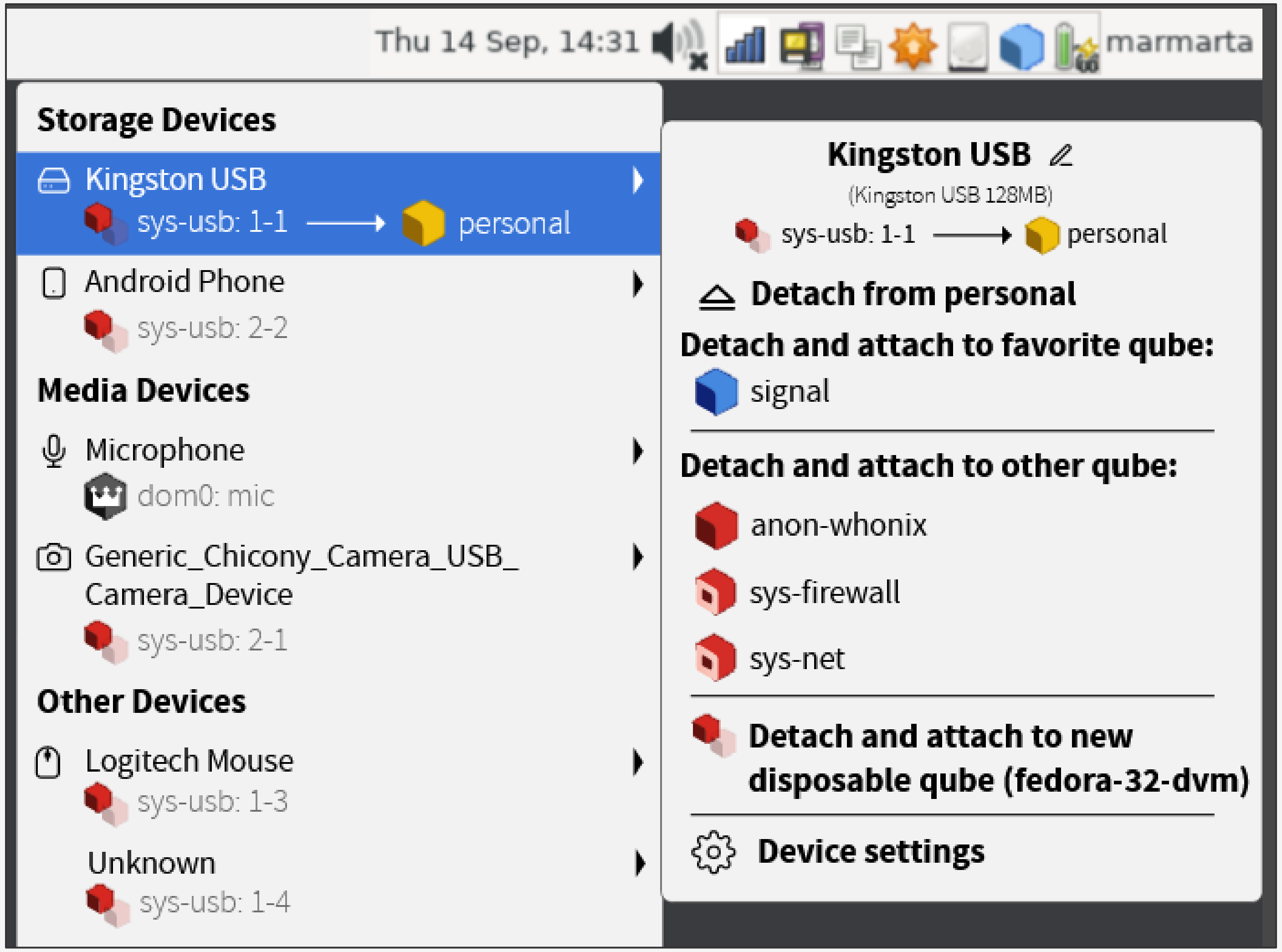
Case study: devices: old view


Data (Block) Devices
developmentn:zram0 - () 0
sys-usb:sda - DataTraveler_2.0 () 7.3 GiB
sys-usb:sda1 - DataTraveler_2.0 (KINGSTON) (developmentn) 7.3 GiB
Audio Input
dom0:mic - Microphone
USB Devices
sys-usb:2-1 - Logitech_USB_Optical_Mouse
sys-usb:2-10 - 8087_0026
sys-usb:2-2 - Kingston_DataTraveler_2.0_50E549513765ED2189611238
sys-usb:2-7 - Generic_Chicony_USB2.0_Camera_0001

Case study: devices



Case study: devices



Thu 14 Sep, 14:31 marmarta

Storage Devices

Kingston USB
sys-usb: 1-1 ⟶ personal

Android Phone
sys-usb: 2-2

Media Devices

Microphone
dom0: mic

Generic_Chicony_Camera_USB_Camera_Device
sys-usb: 2-1

Other Devices

Logitech Mouse
sys-usb: 1-3

Unknown
sys-usb: 1-4

Kingston USB
(Kingston USB 128MB)
sys-usb: 1-1 ⟶ personal

Detach from personal

Detach and attach to favorite qube:
signal

Detach and attach to other qube:
anon-whonix
sys-firewall
sys-net

Detach and attach to new disposable qube (fedora-32-dvm)

Device settings

How to Design for Security

- Design for error, not just for success
- Secure should be easy, insecure hard
- Design for actual humans, not for perfect people
- Cutting corners will happen: plan for it