Genode's TrustZone demo on the USB Armory
story, design, and use

Martin Stein
<martin.stein@genode-labs.com>

Outline

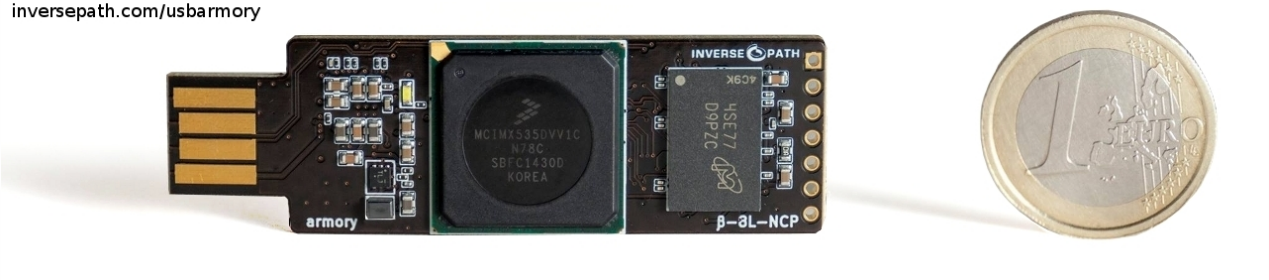
1. Background and Motivation
2. Implementation
3. Results

Outline

What is the USB Armory?

INVERSE PATH

inversepath.com/usbarmory



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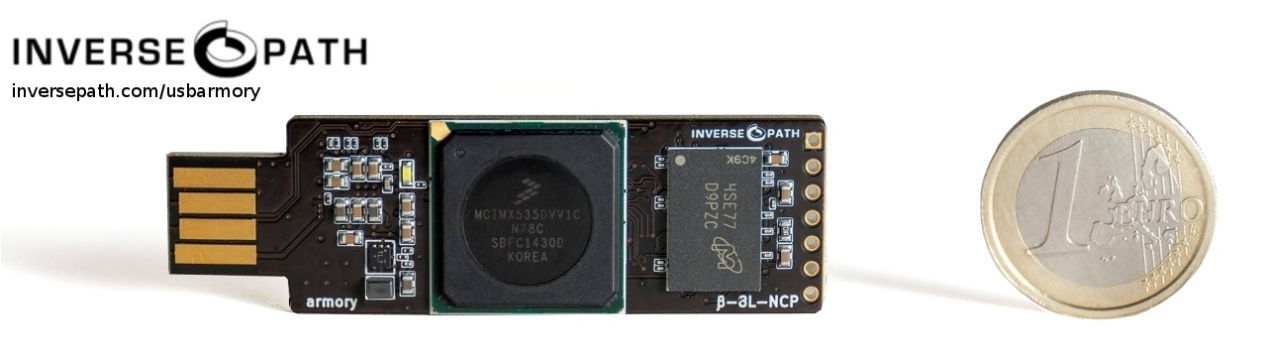

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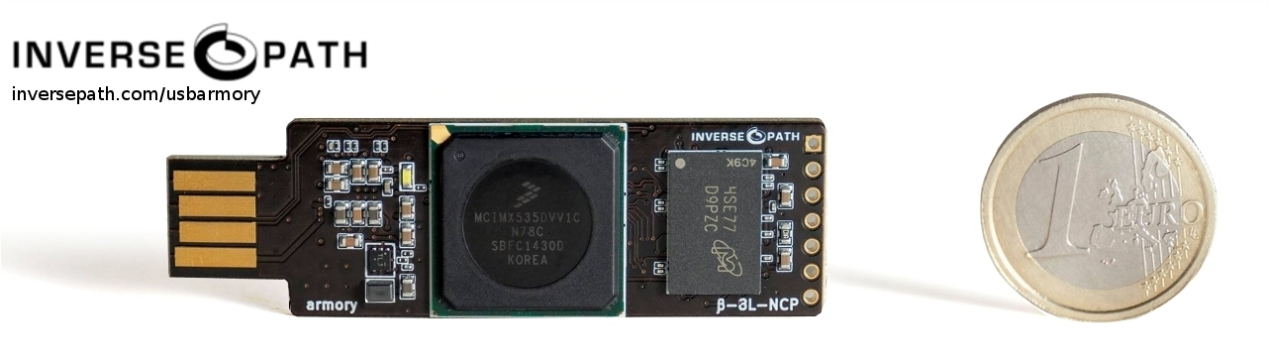

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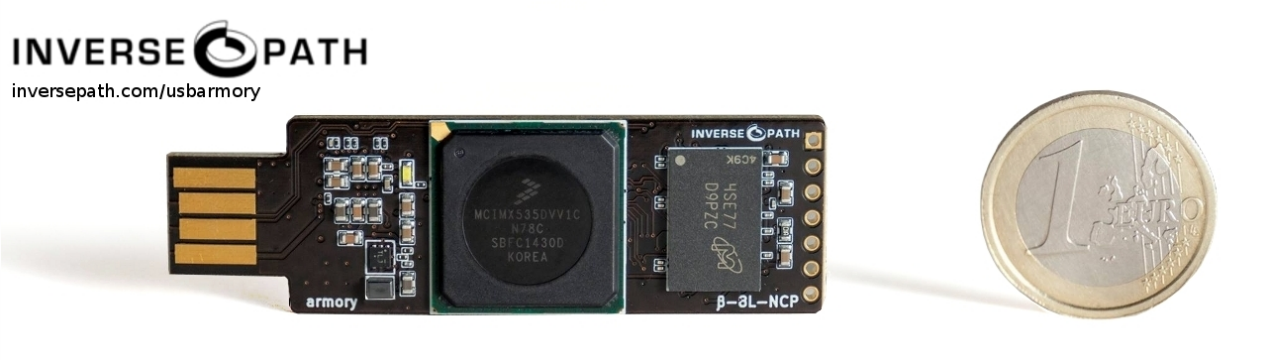

- USB stick computer that runs standard Linux distributions
- Open design featuring i.MX53, TrustZone, Secure Boot, and an LED
- Communicate with Linux via Ethernet

What is Genode?

Microkernels
Capabilities
Componentization
Virtualization

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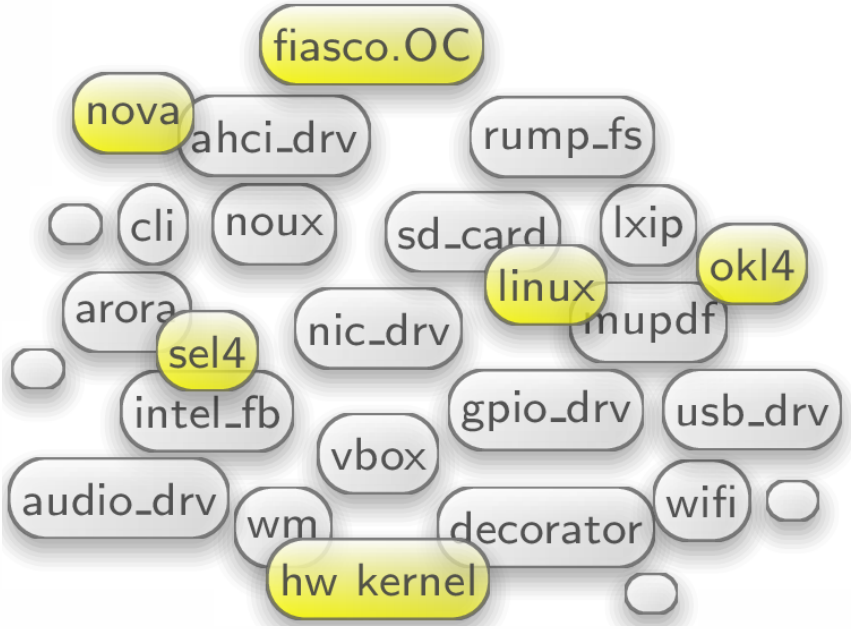

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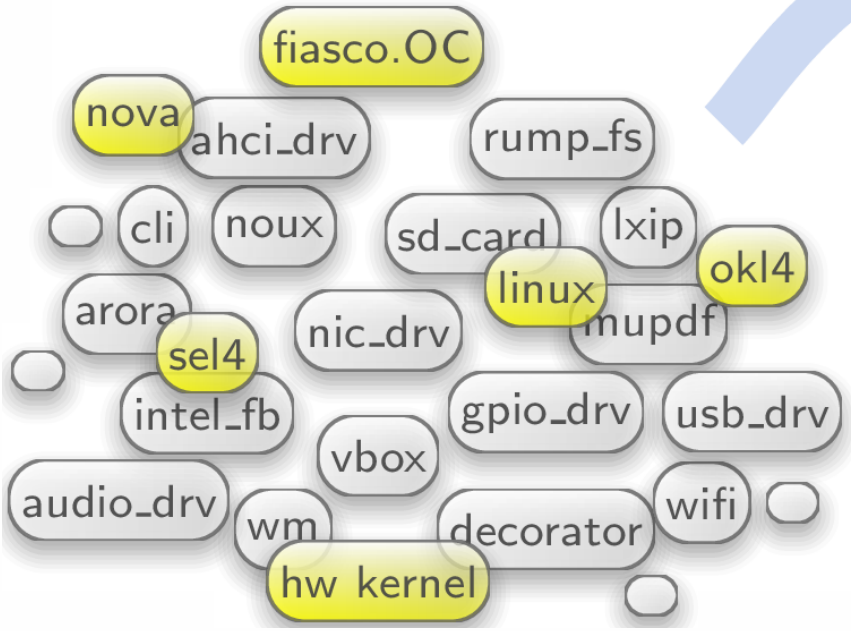

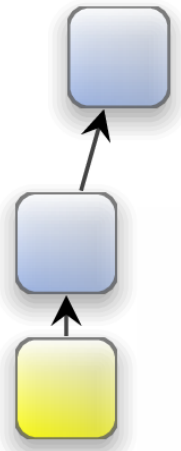

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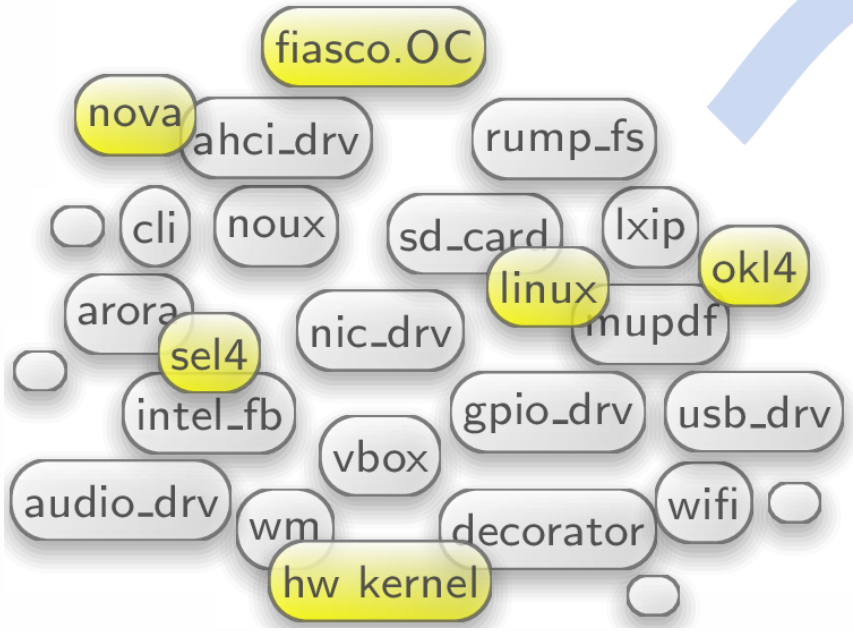

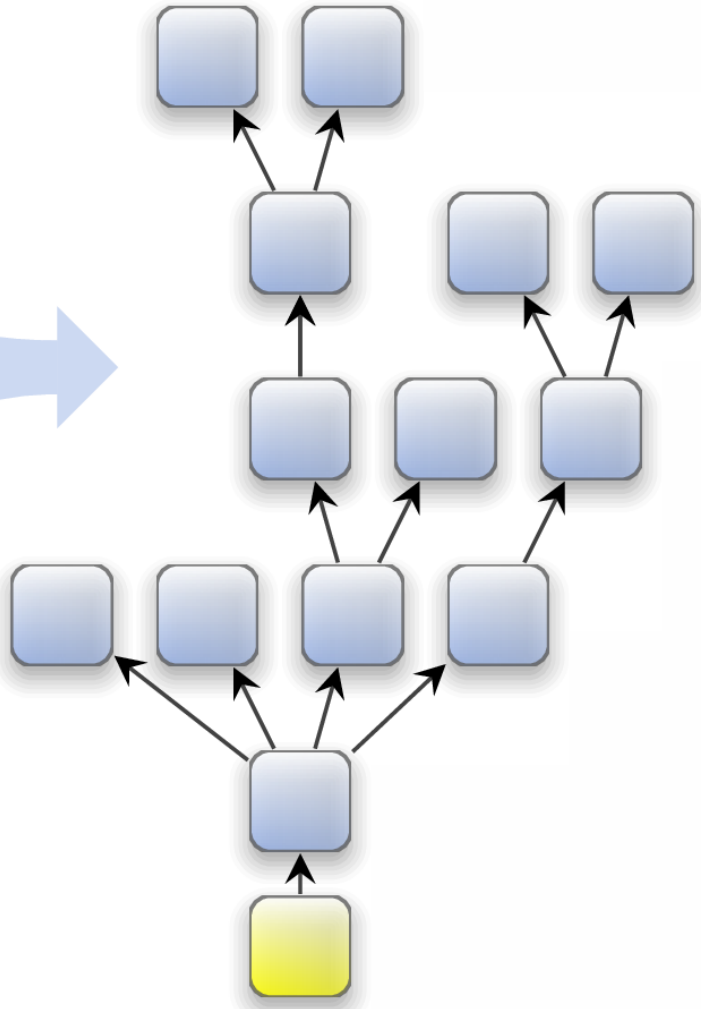

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- The rest is implementer specific

TrustZone on the i.MX53

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Central Security Unit

- Separates RAM/MMIO
- Defines permissions of DMA engines

TrustZone in Genode

In our custom kernel

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- VMM component
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  - Acts as Bootloader for VM OS
  - Controls VM context

Motivation for the USB Armory demo

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Goals

- Put Normal world Linux under the supervision of Secure world Genode
- Keep feature parity with the original USB Armory setup

Outline

First steps

Basic Linux setup with Busy Box initrd

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- Shared unprotected UART between worlds
- Adapted Linux IC driver
- Adapted Linux RAM configuration

Towards a broader feature set

Provide a rich rootfs **and** protect the eSDHC

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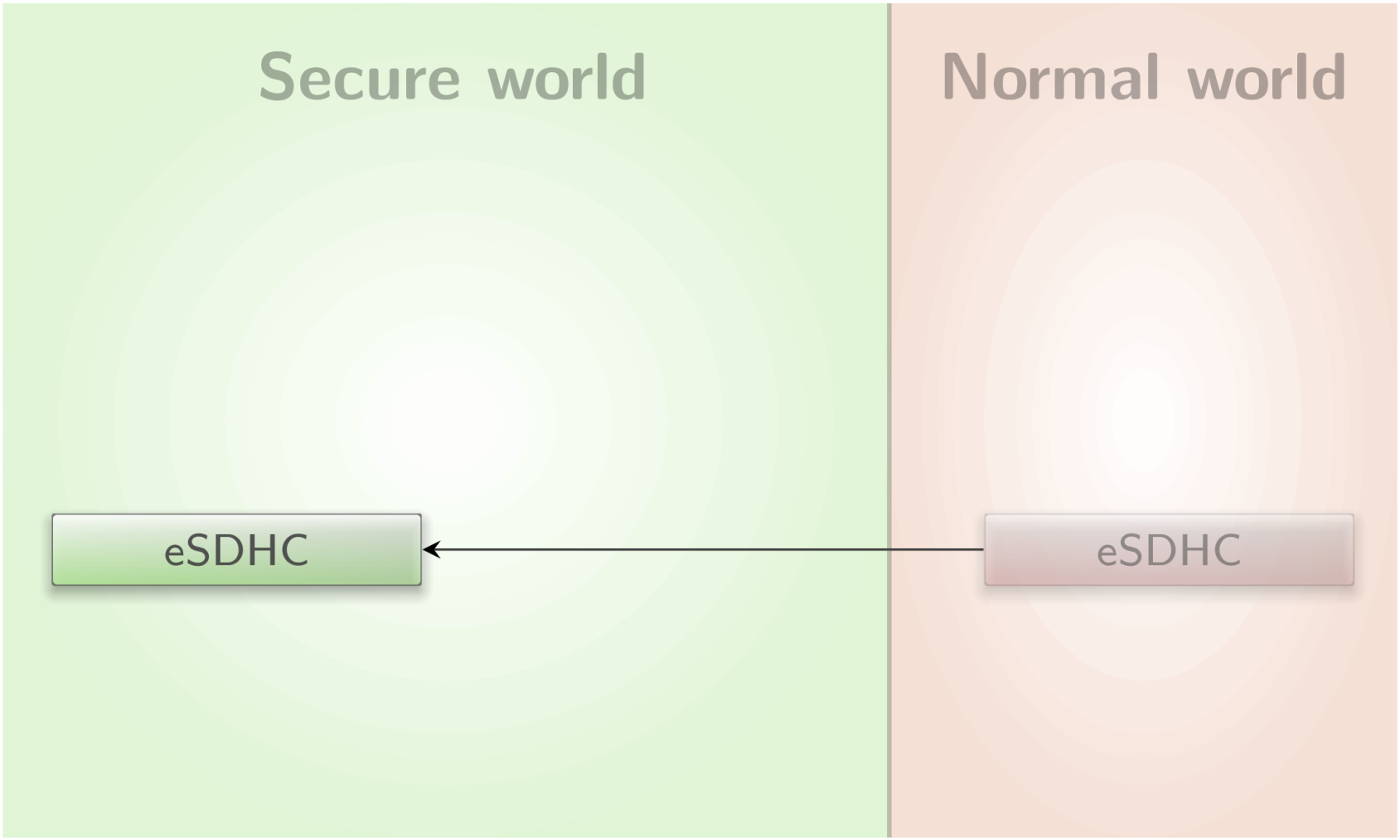
Provide a rich rootfs **and** protect the eSDHC

→ Para-virtualized block driver

Separation of the SD card



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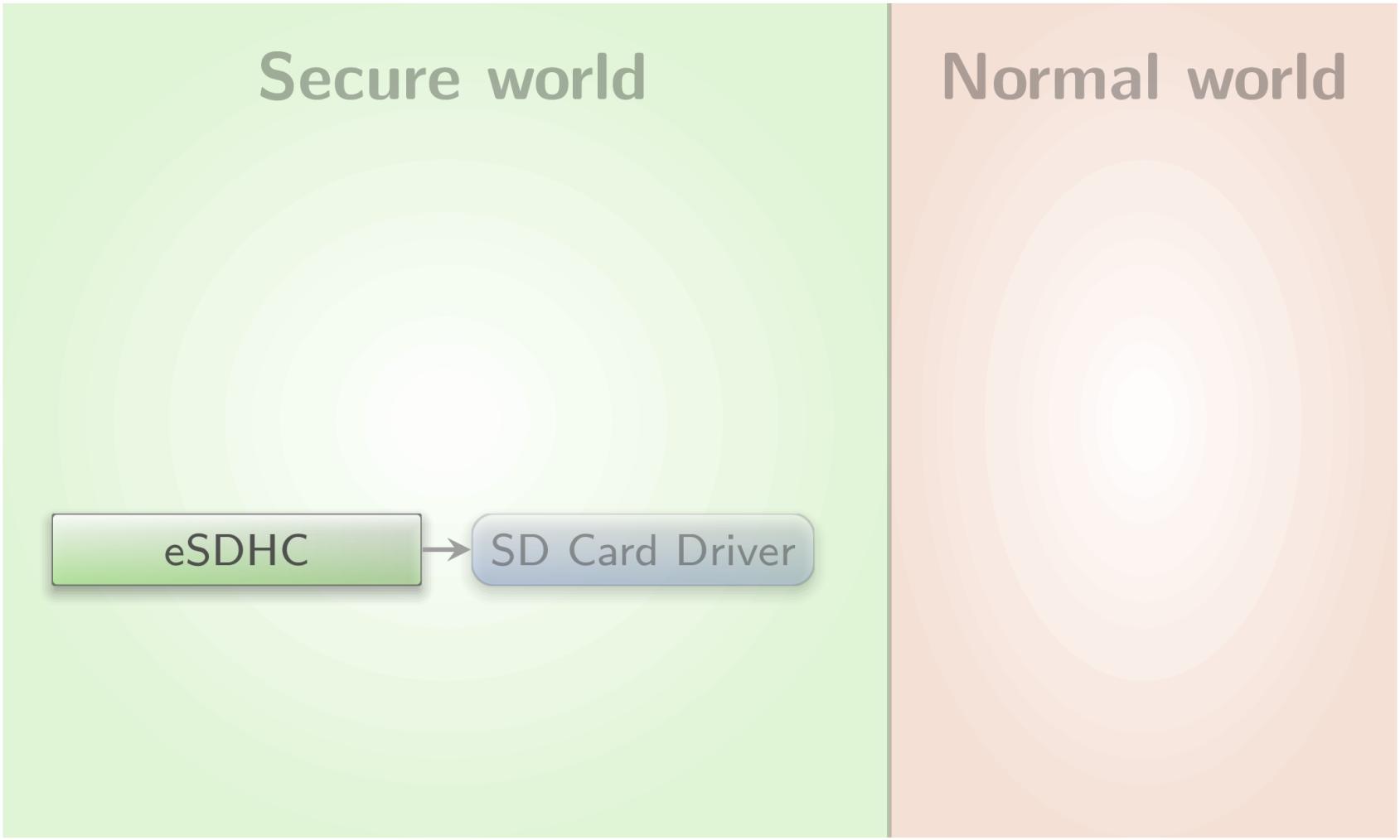

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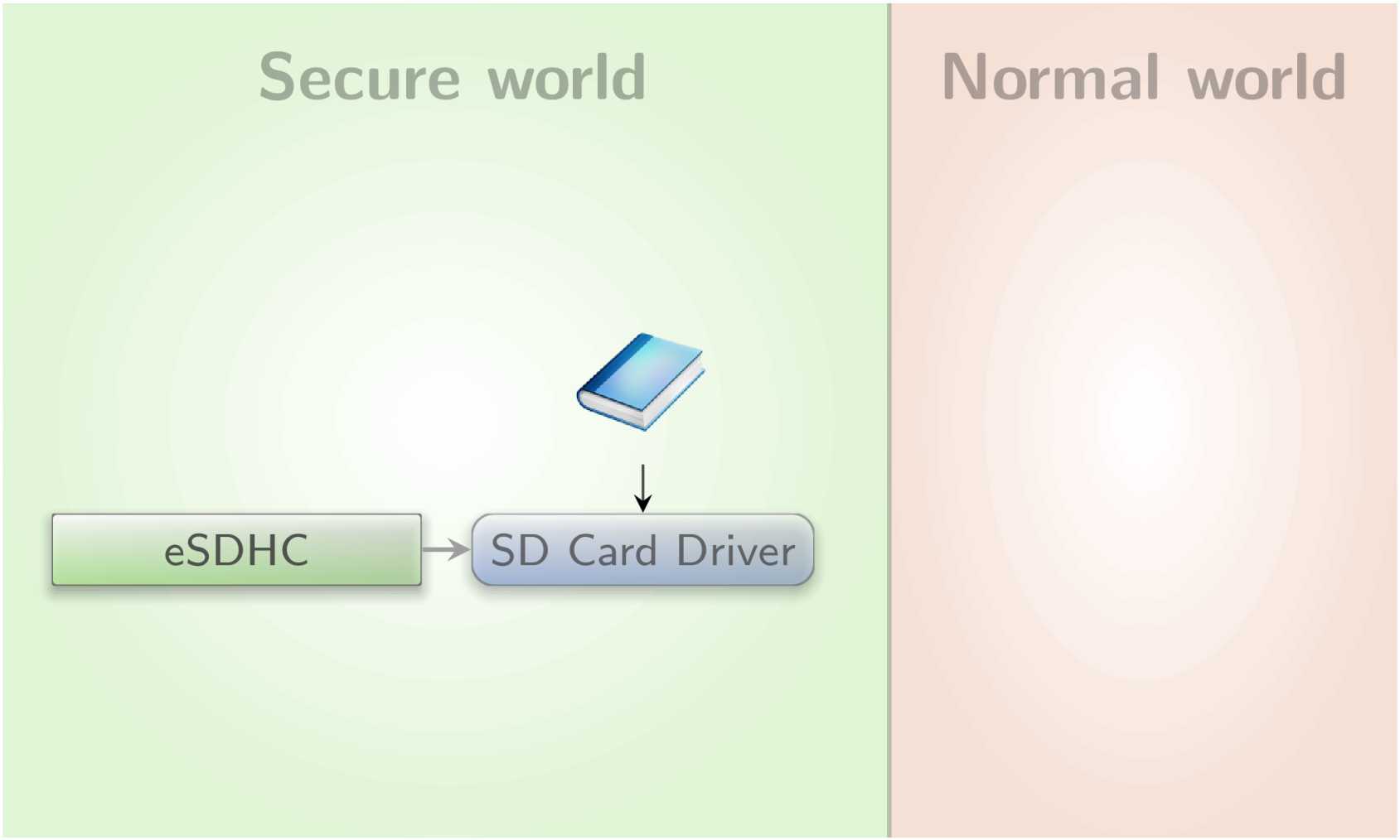

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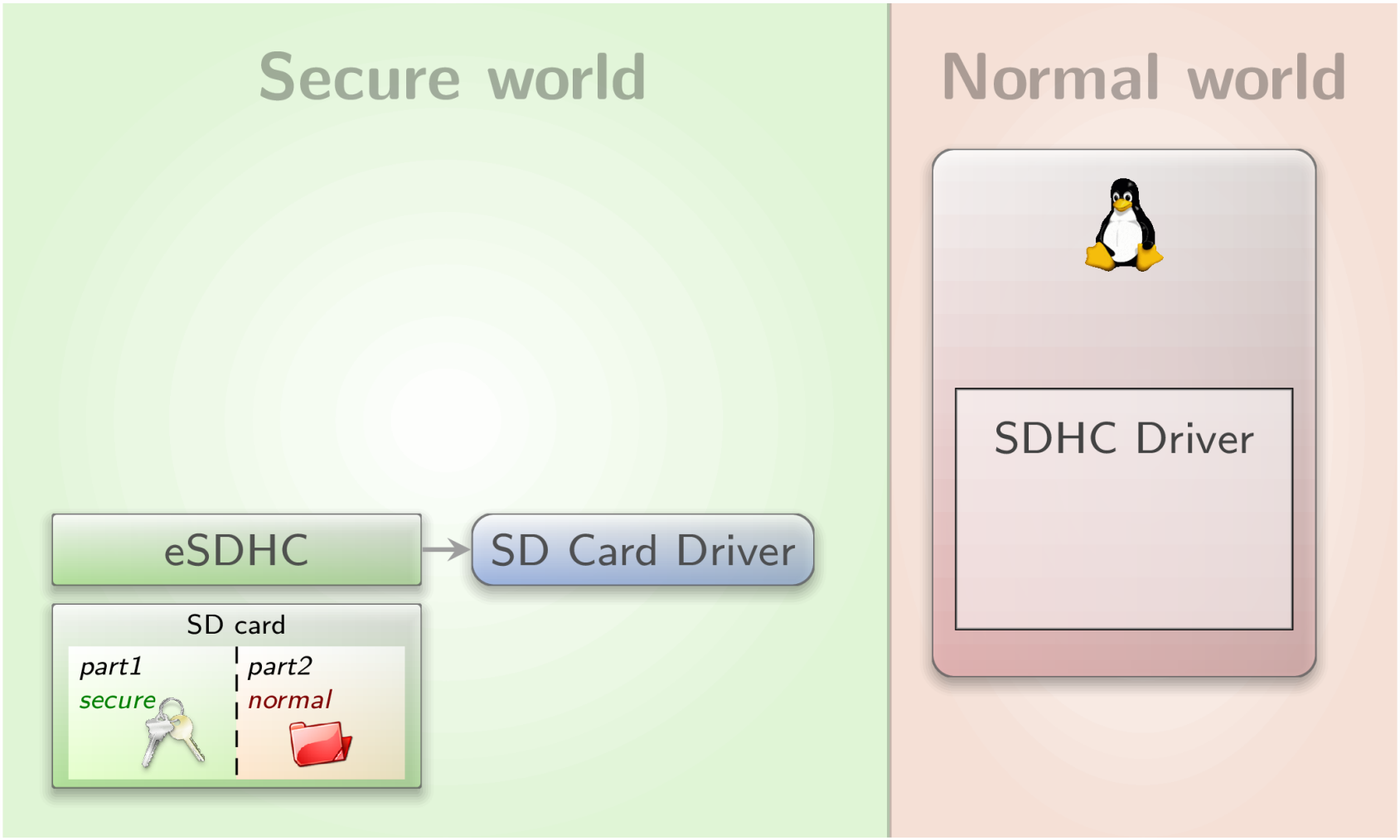

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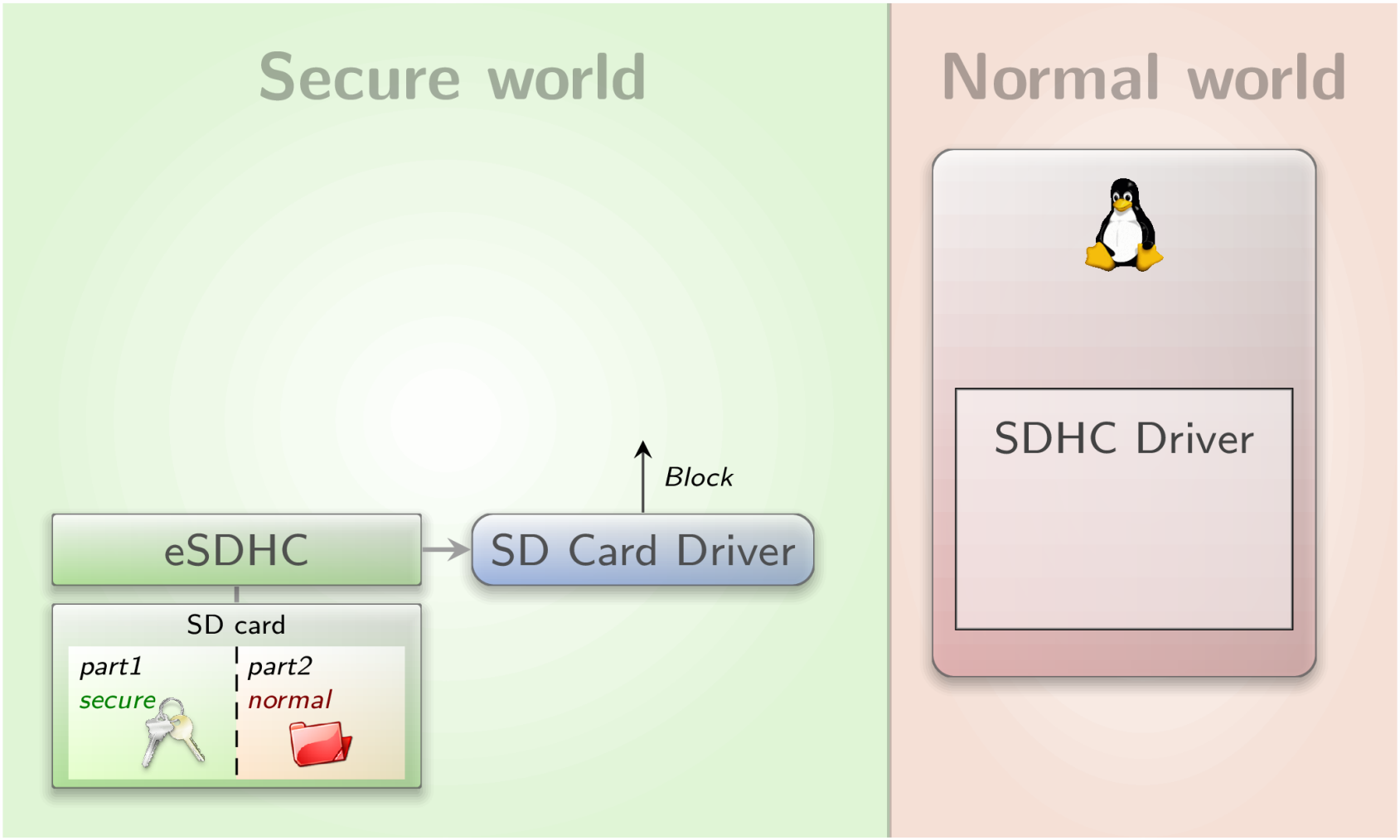

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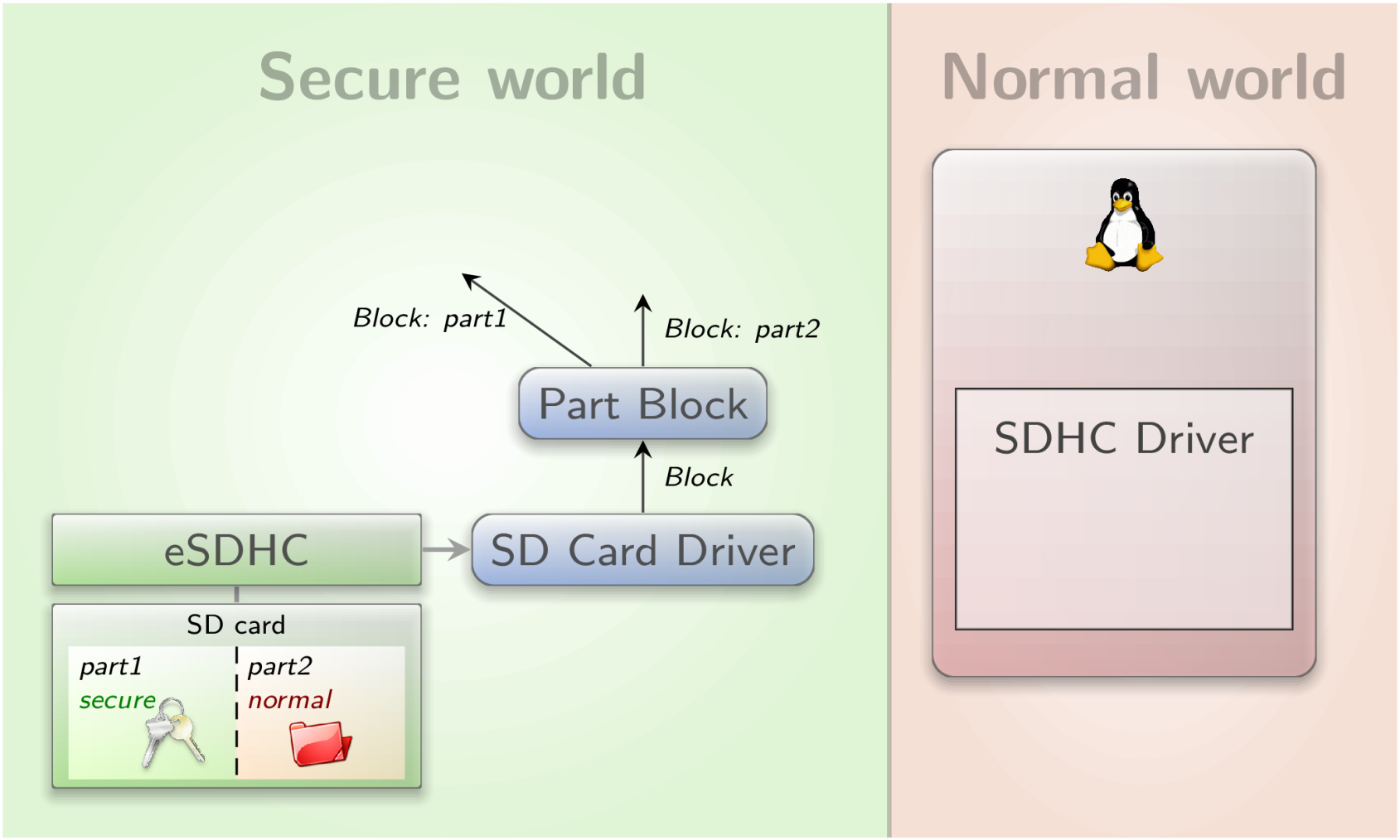

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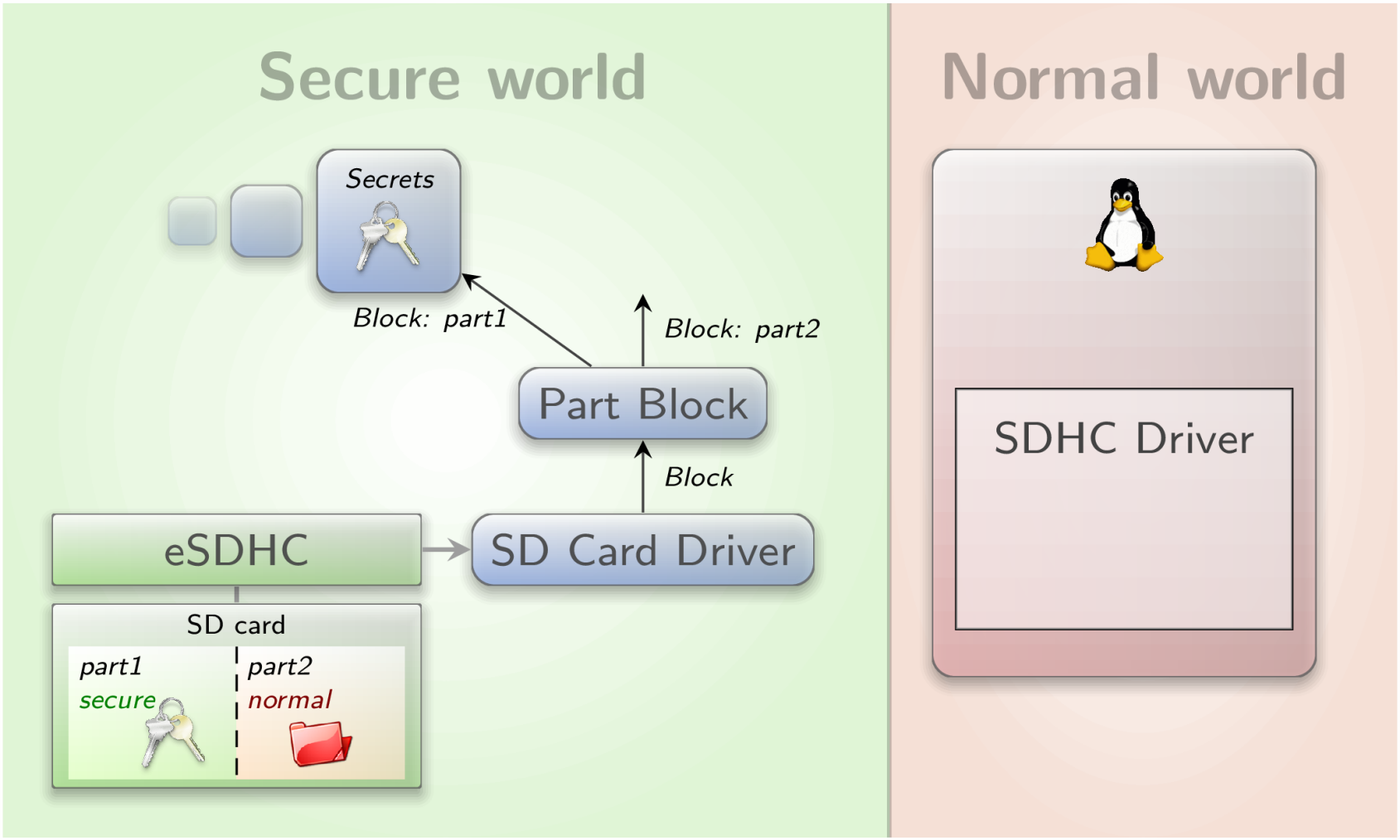

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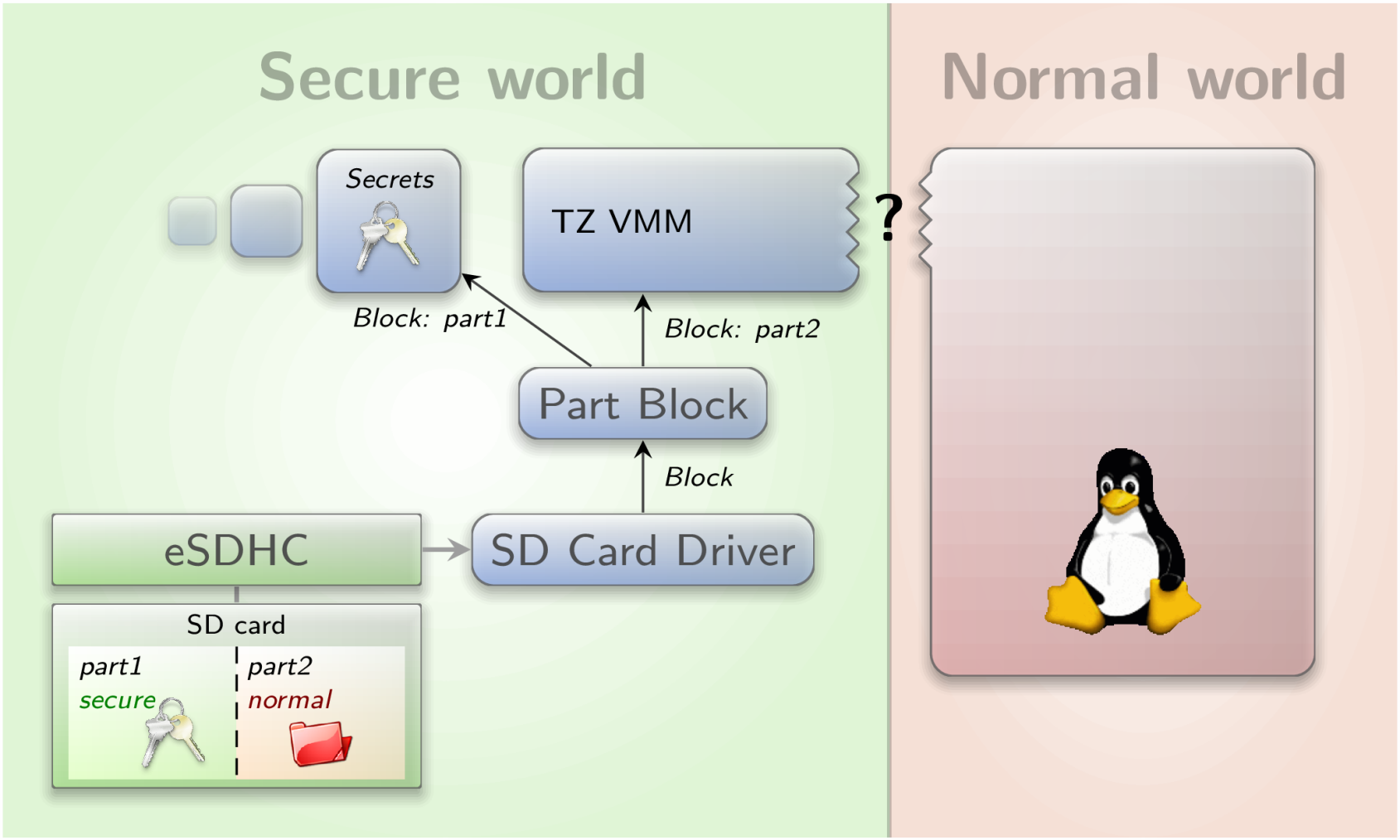

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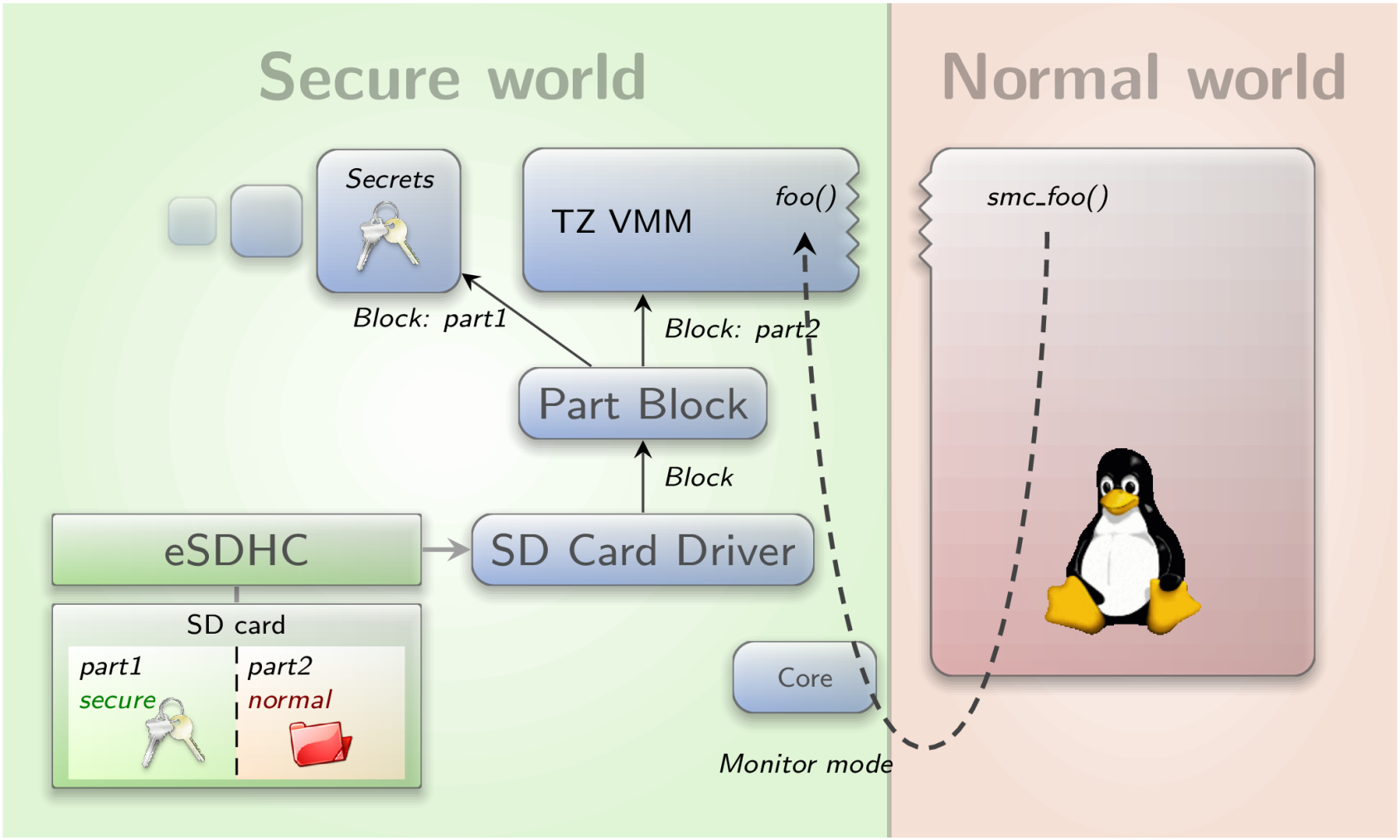

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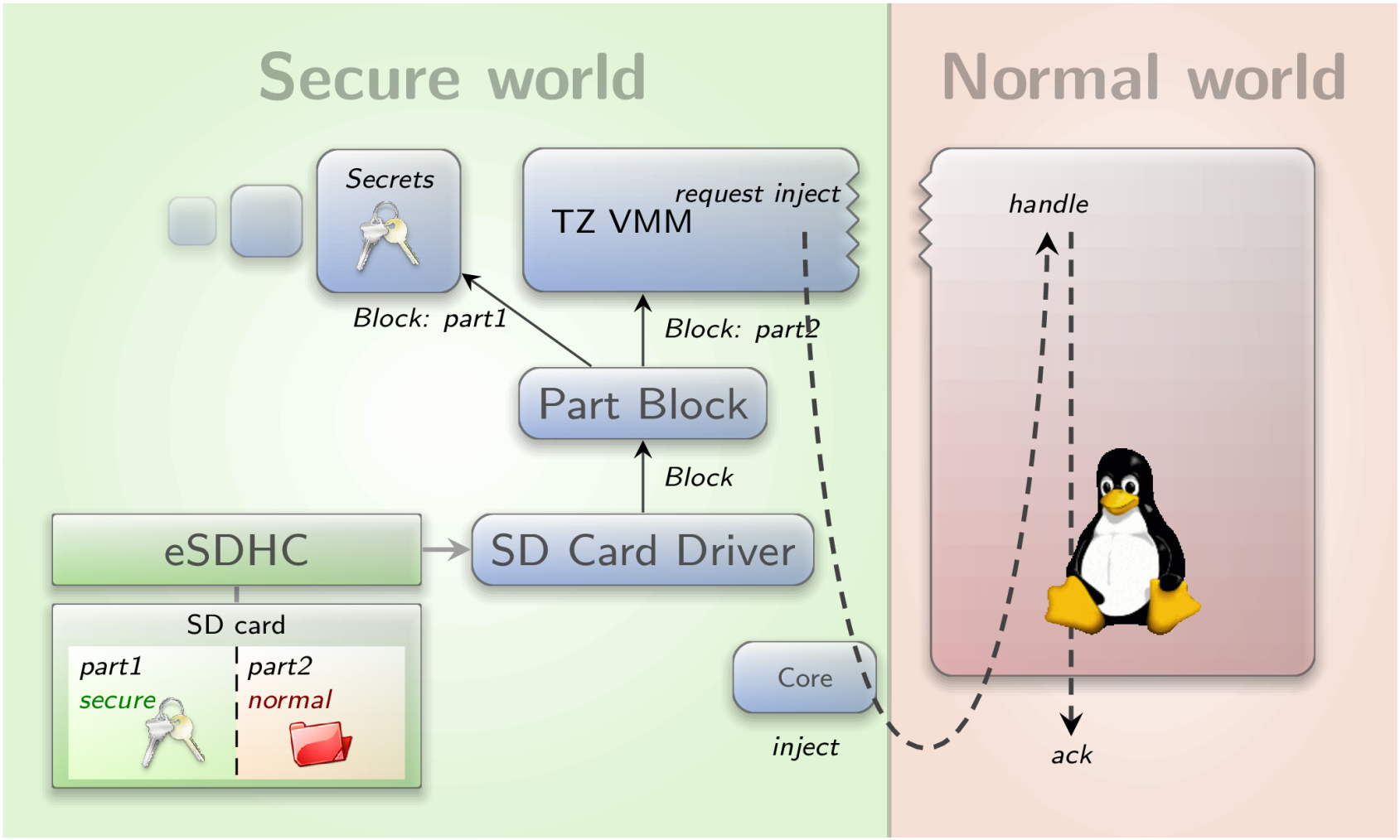

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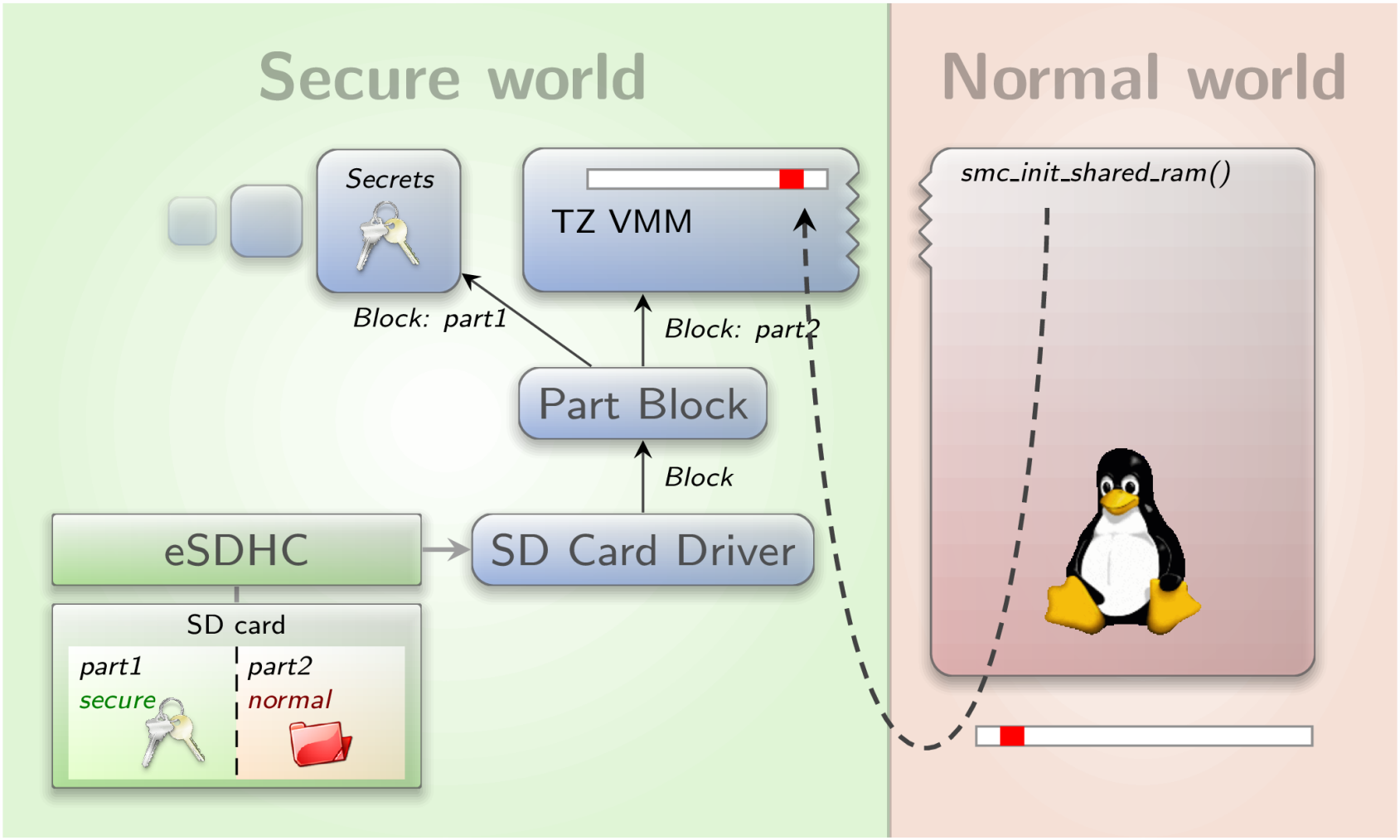

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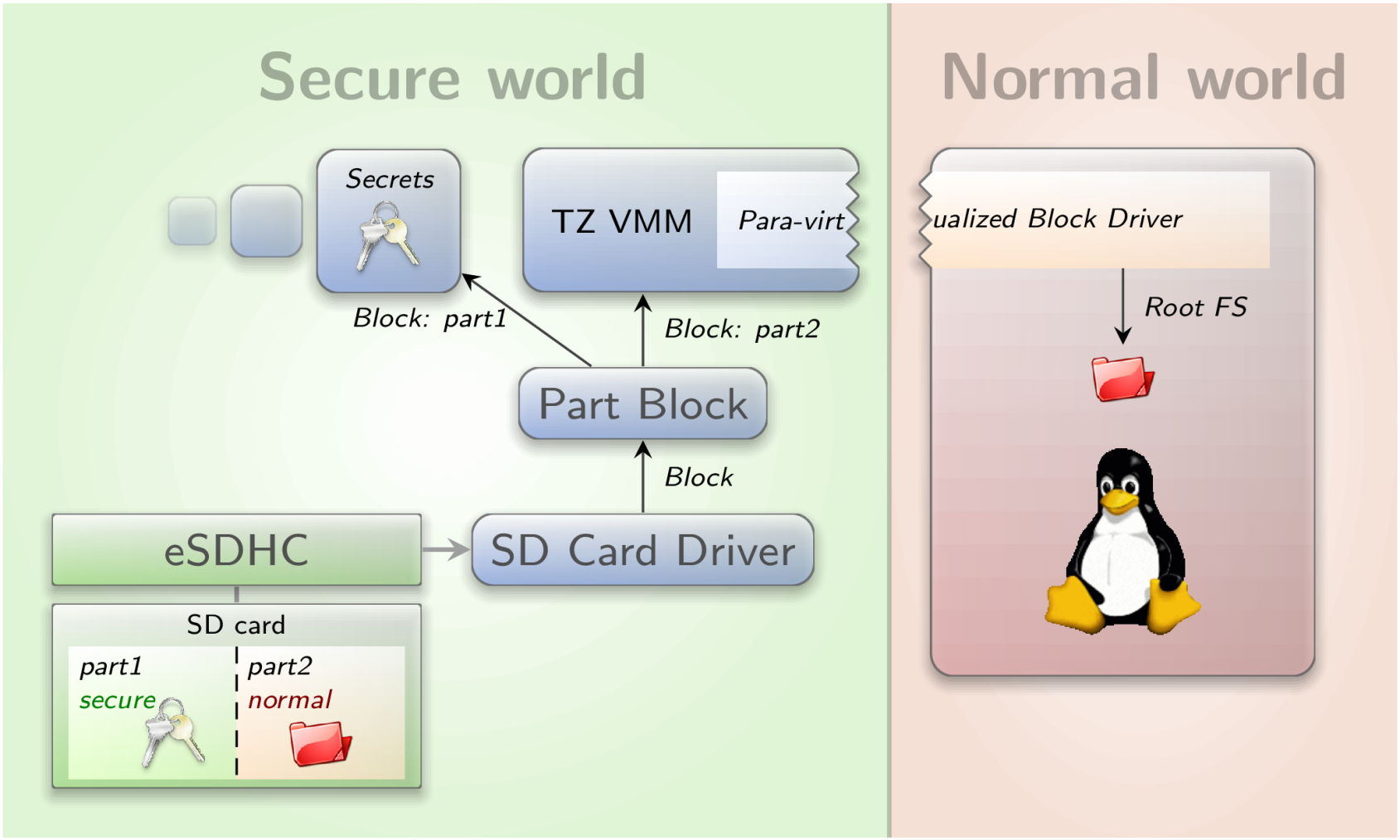

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- Serial output should be para-virtualized too

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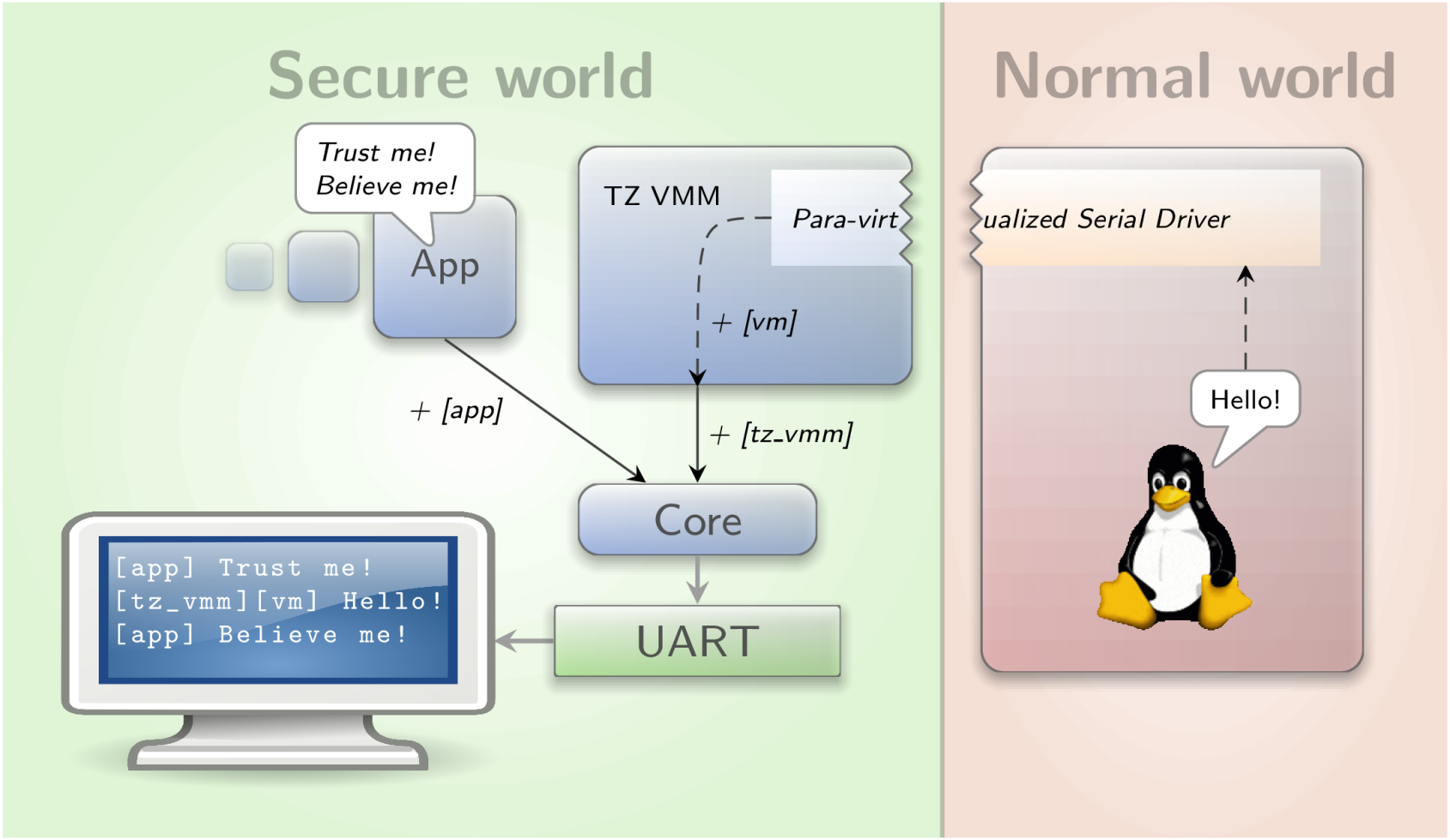

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  - Linux asks for card state because of flaky host state!
  - Fixed the errors!

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- LED driver
- Setup is easy to reproduce and adapt

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- LED not trustable
- No power saving
- eSDHC driver pretty basic

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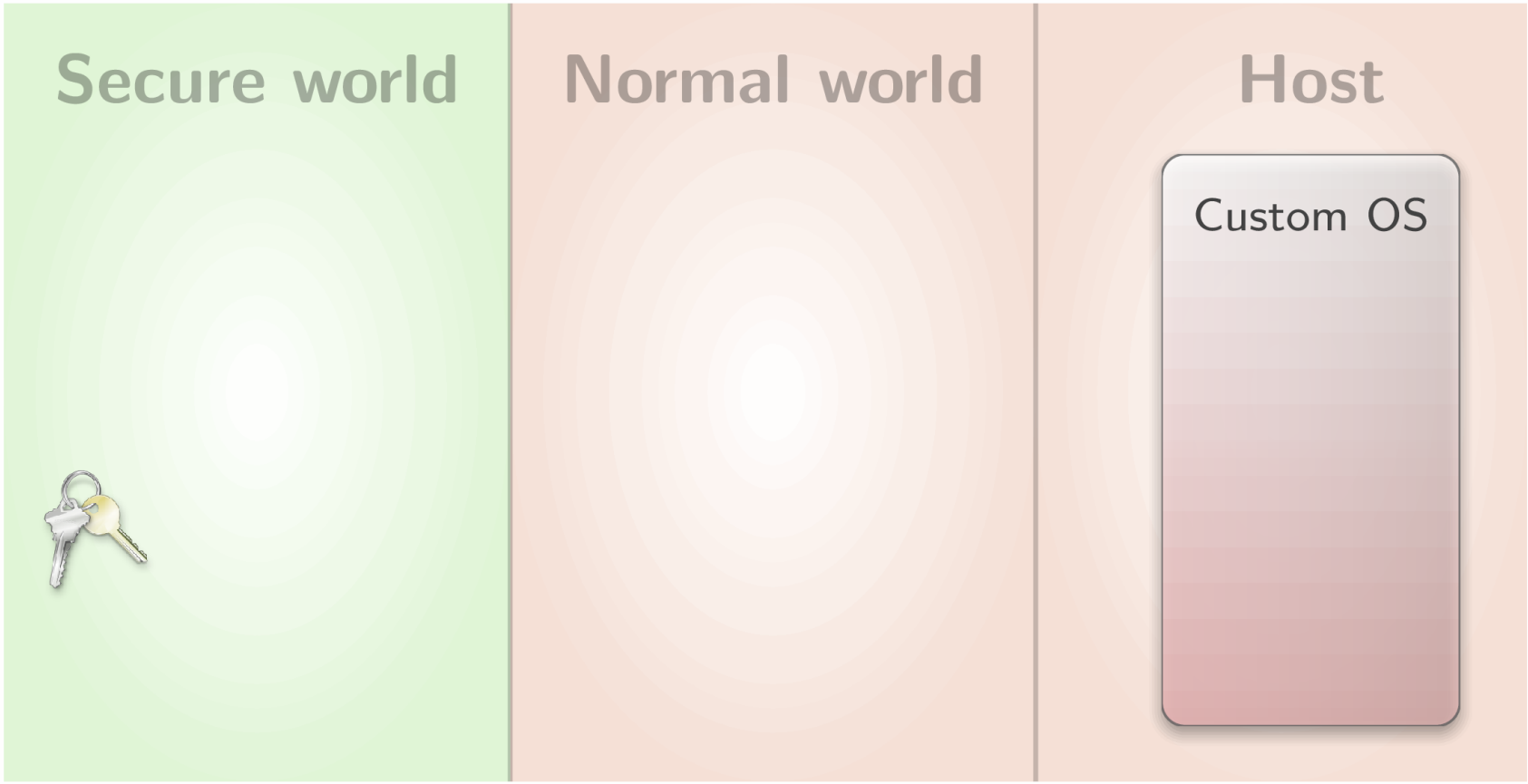

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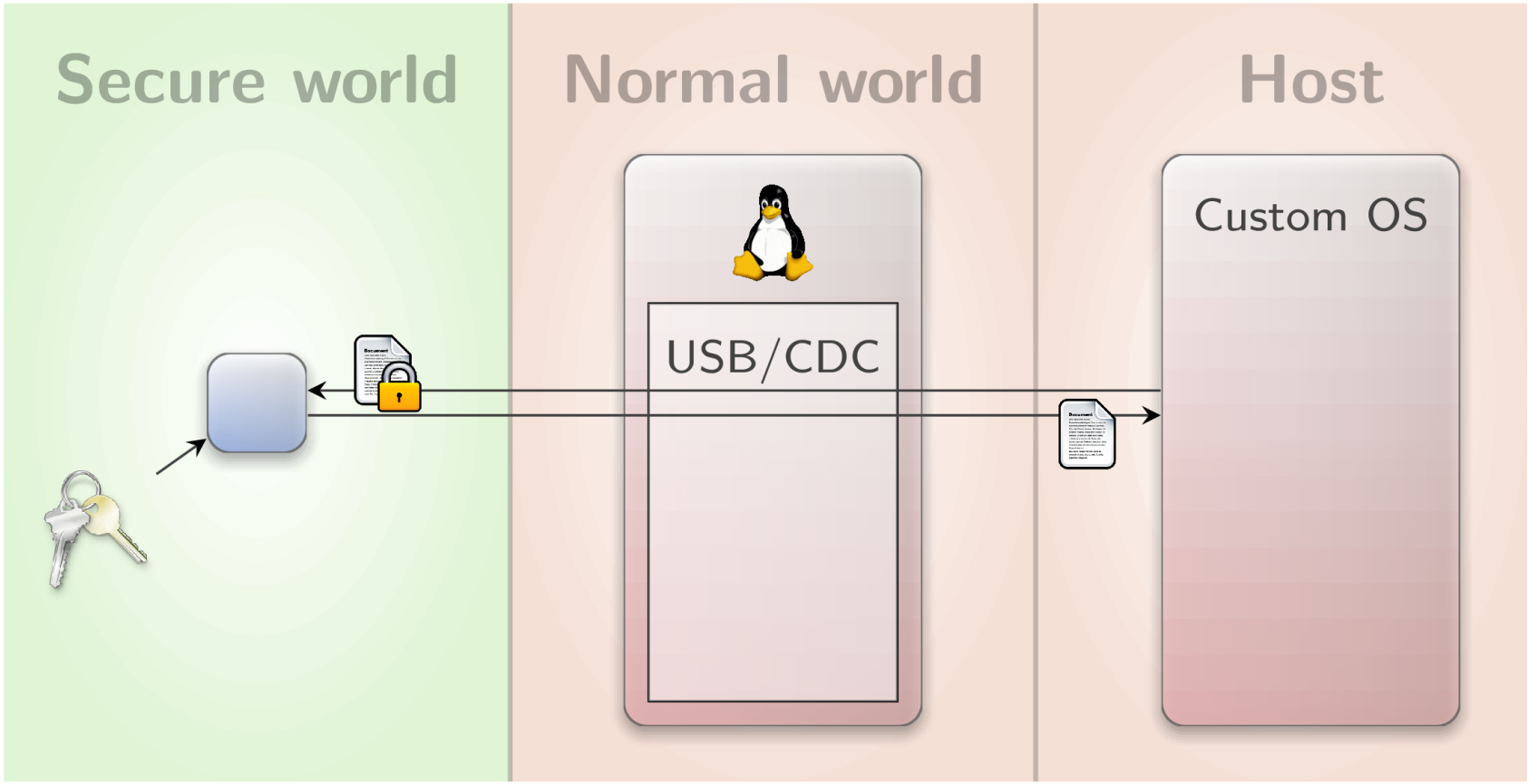

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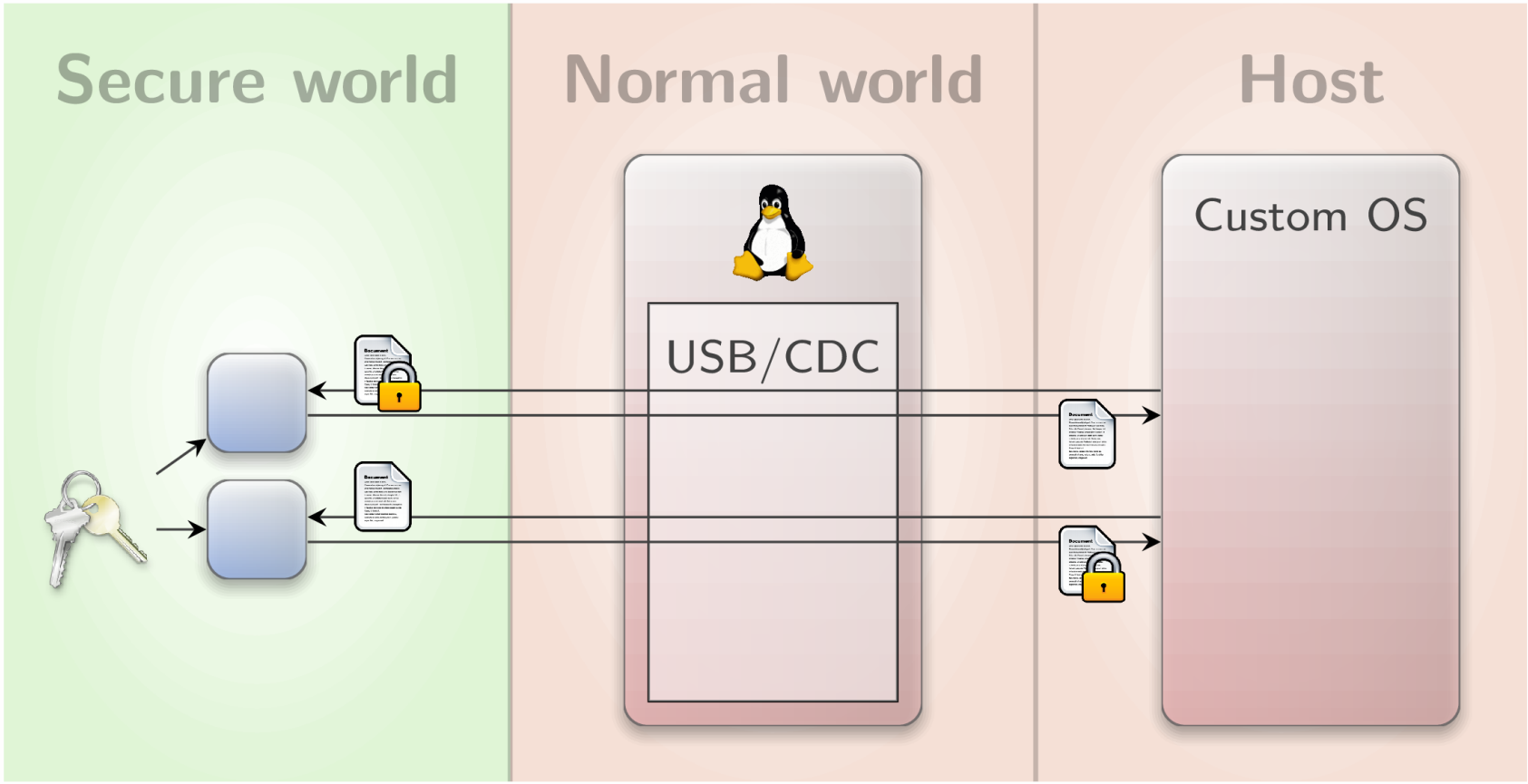

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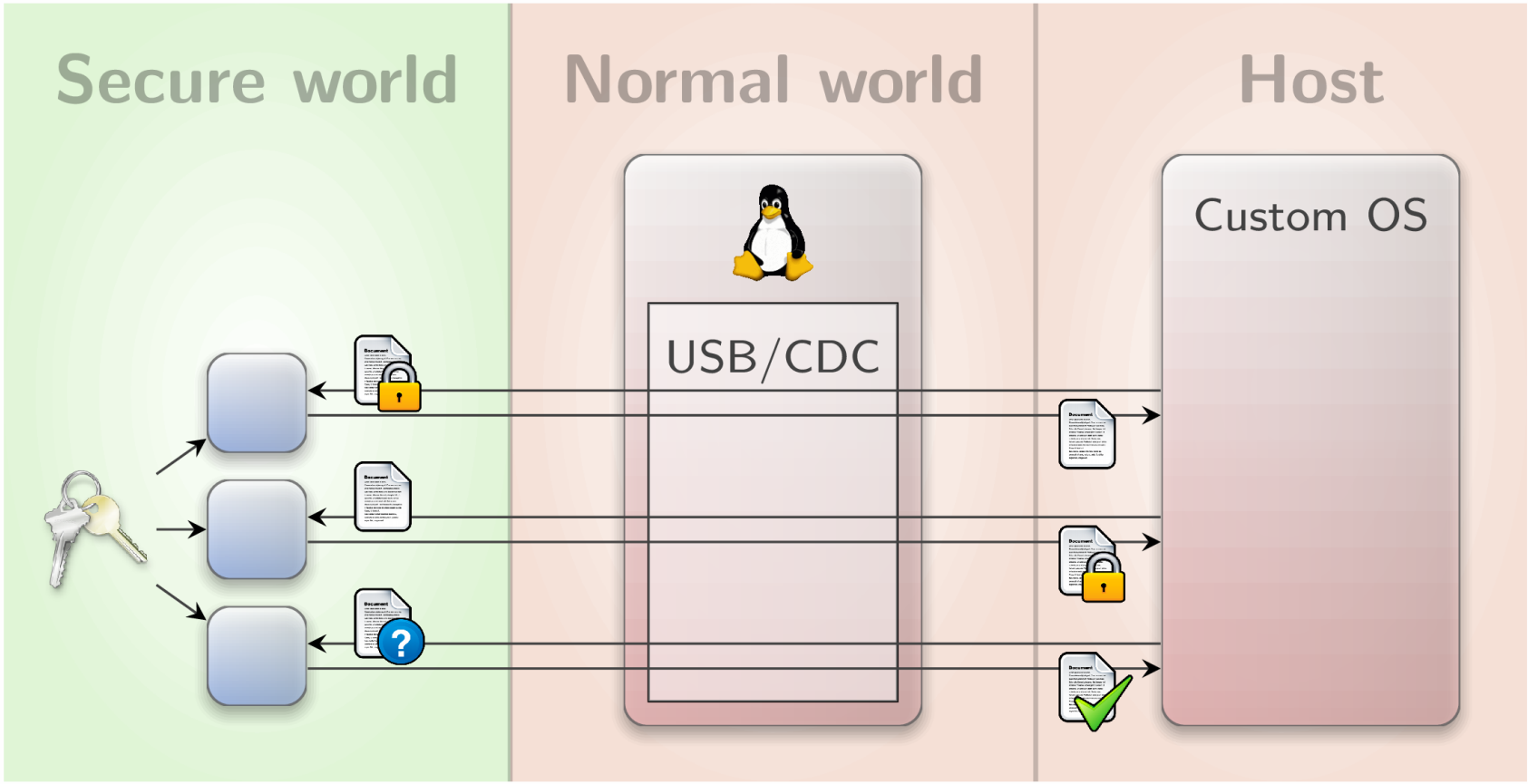
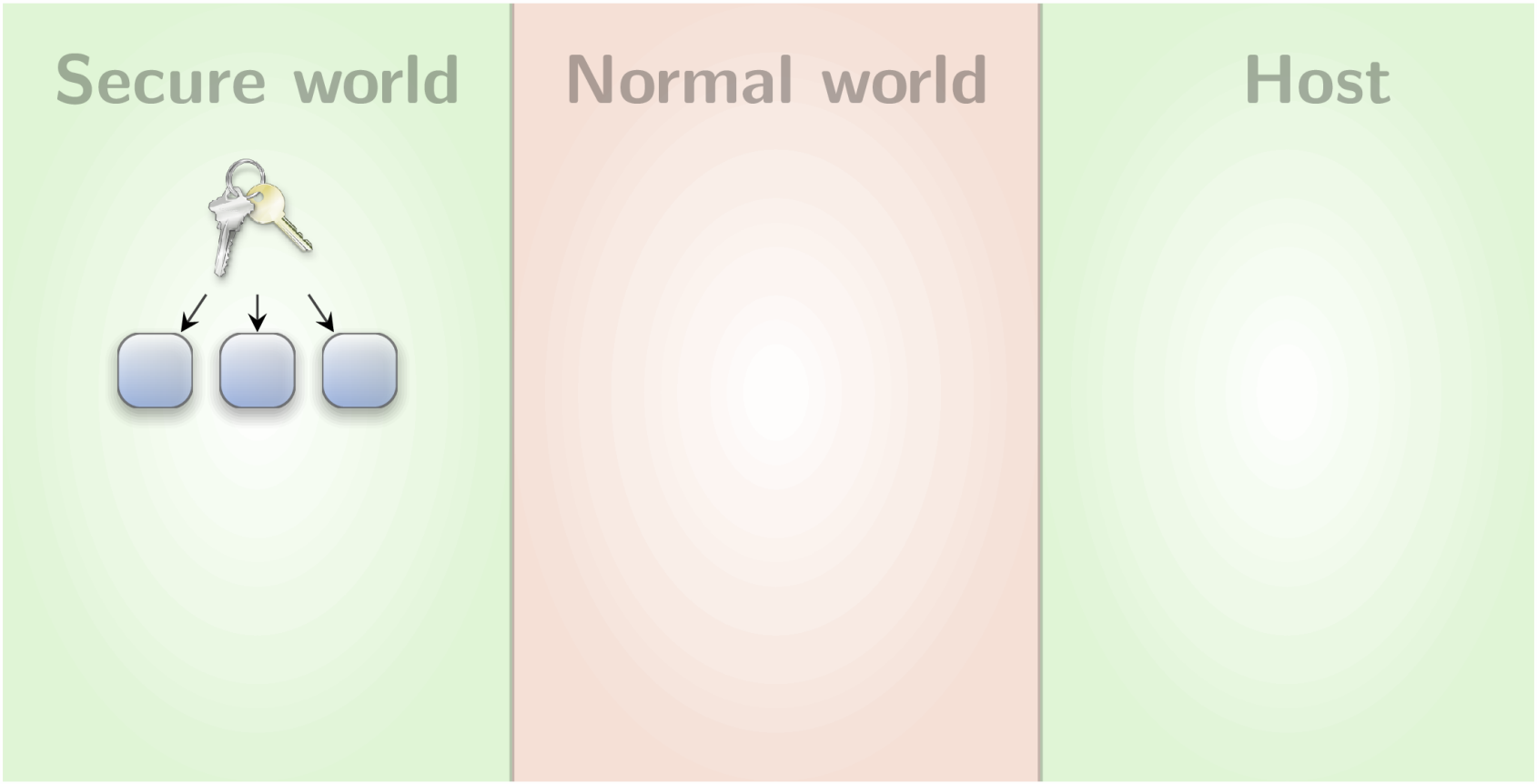


Vision - Distributed Genode



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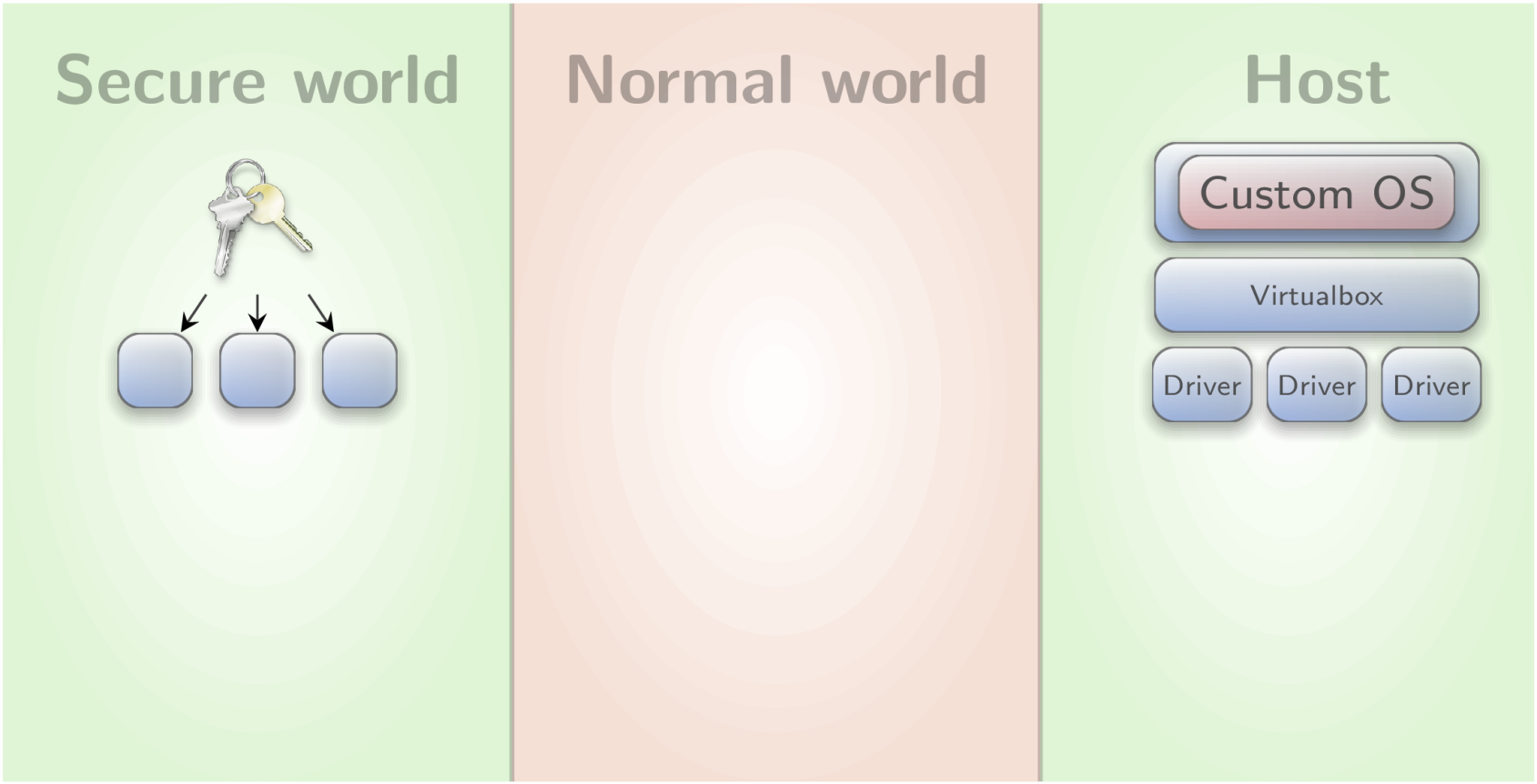

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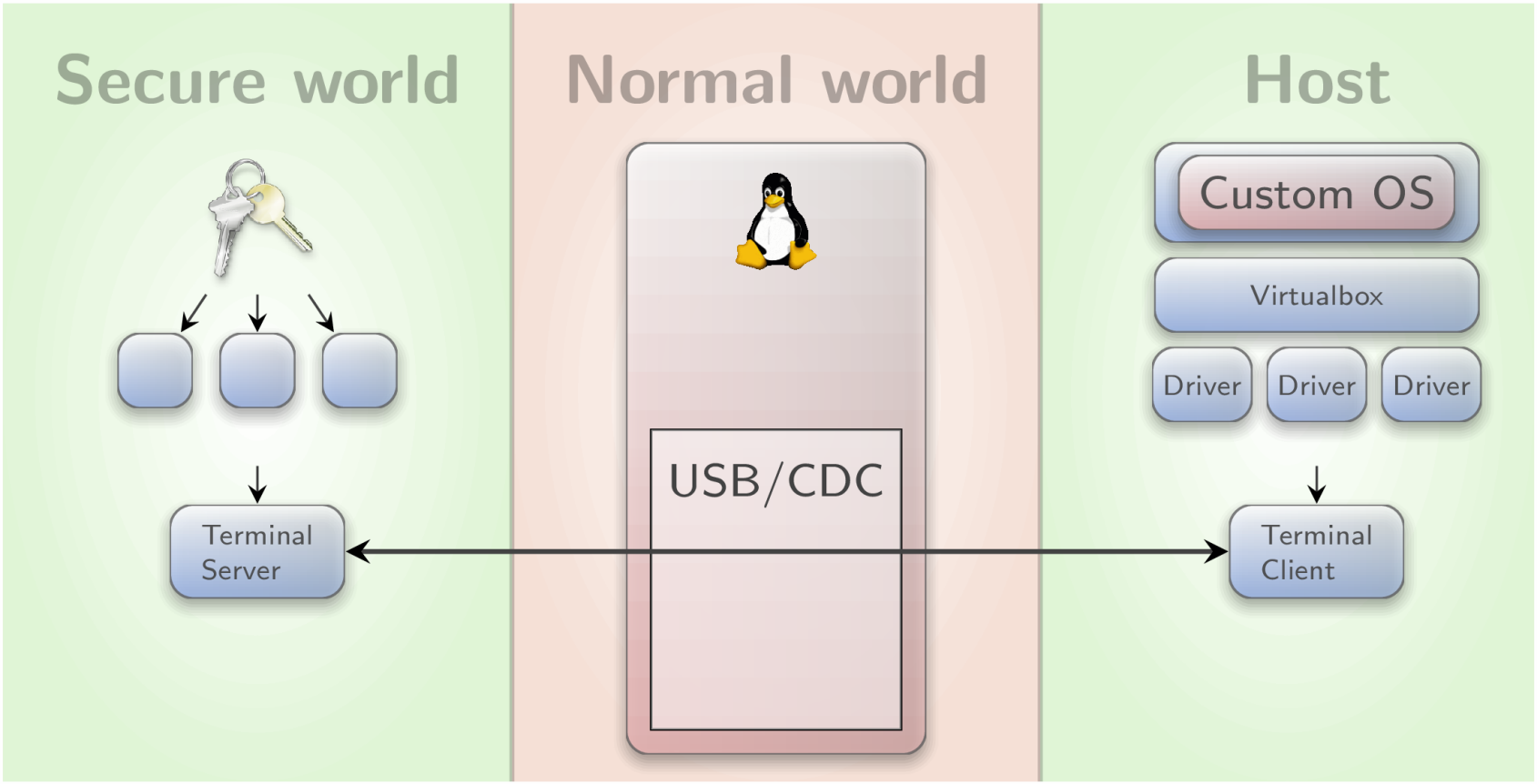

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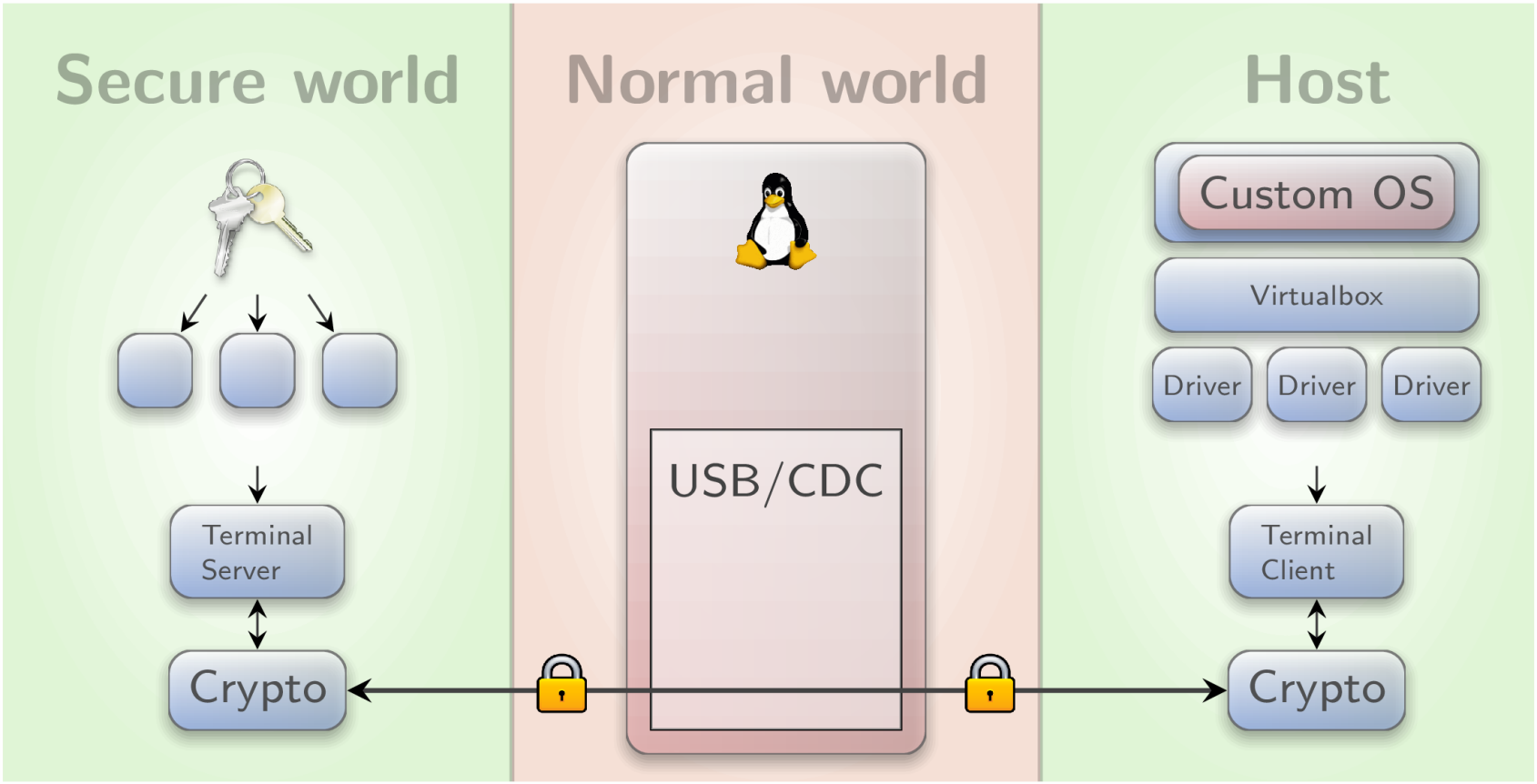

Thank you

USB Armory

`https://inversepath.com/usbarmory`

Genode OS Framework

`http://genode.org`

Genode Labs GmbH

`http://genode-labs.com`