Hardware random overview

Contents

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A quality version of this page, approved on *17 February 2021*, was based off this revision.

This article gives information about the Linux® hardware random framework.

Contents

1 Article Purpose

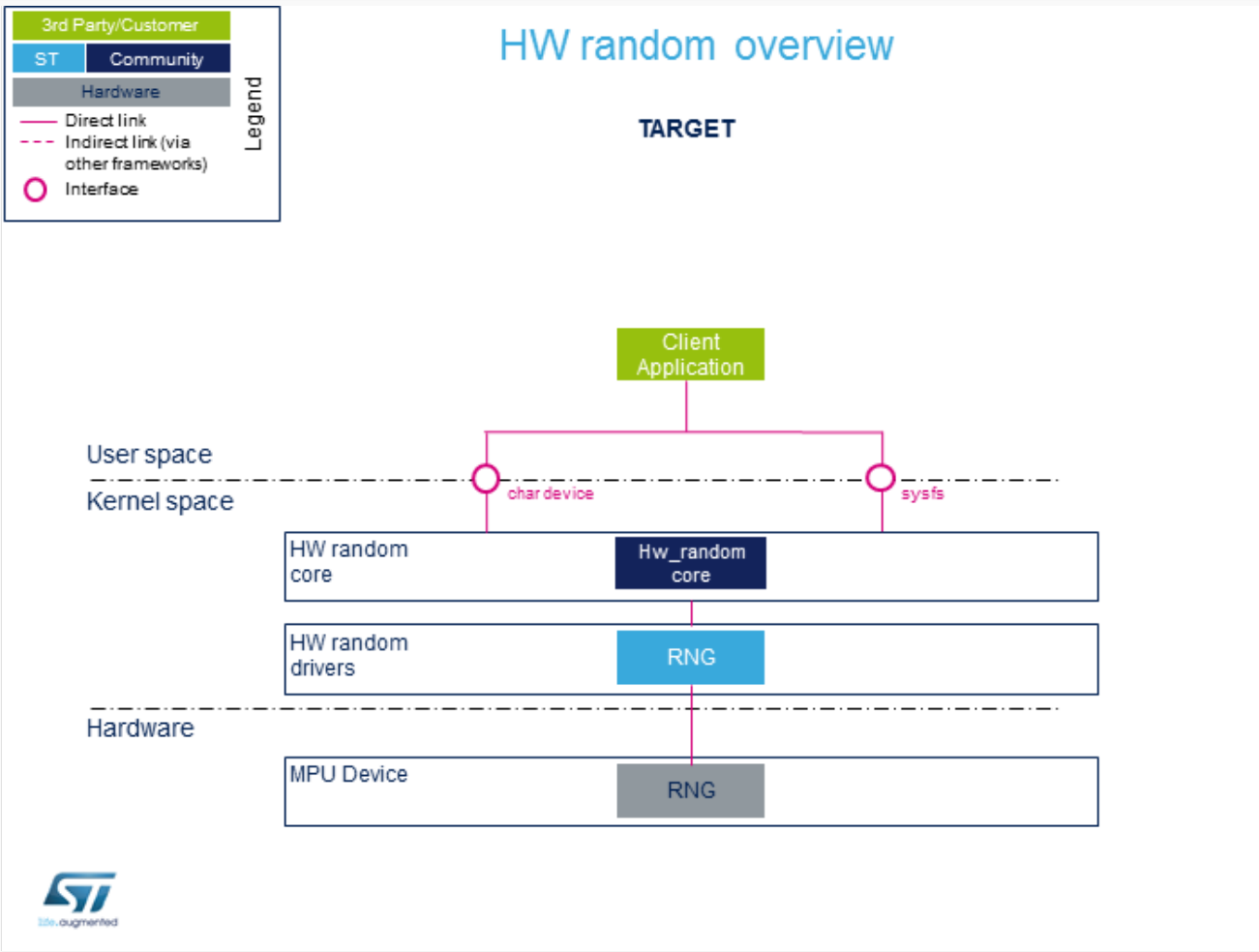
This article gives information about the hardware random (HWRNG) framework.

2 Framework purpose

The Hardware random framework is integrated in the kernel. It provides access to RNG peripherals and focuses on supporting the hardware number generator.

3 System overview

The HW random framework allows retrieving random numbers in userland.



Hw Random

3.1 Component description

- **HW random core** (Kernel space)

Generic interface in kernel space. This layer is in charge of creating the character device (char device) and sysfs to access hw_random.

- **RNG** (Kernel space)

Hardware random Linux® drivers handling the HW blocks.

- **RNG** (Hardware)

HW blocks handling the RNG peripheral.

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The Hardware random framework uses char device API[1] ioctl operations. For additional information, refer to:

- sysfs interface.
- Kernel Documentation directory[2]

4 Configuration

4.1 Kernel configuration

The Hardware random support is activated by default in ST deliveries. No specific configuration is required apart from enabling or disabling peripheral support using Linux® Menuconfig tool. Refer to Menuconfig or how to configure kernel and select:

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4.2 Device tree configuration

DT configuration can be done thanks to the STM32CubeMX.

A detailed device tree configuration is described in RNG device tree configuration.

5 How to use the framework

The framework provides external interfaces from userland : How to control RNG.

5.1 How to use from char device

The community tool for using Hardware random framework is rng_tools[3] which provides a complete set of utilities related to random number generators:

- **rngd**: runs a background daemon that opens /dev/hwrng file (default) to connect and retrieve random numbers.
- **rngtest**: runs different tests that check the entropy and verify the compliance regarding FIPS 140-2 standard.

5.2 How to use from sysfs

Available devices compatible with Hardware framework can be listed using sysfs commands:

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Board $> cat /sys/class/misc/hw_random/rng_available
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The selected device is shown here:

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Light information on the framework can be accessed by using sysfs.

By default, the framework does not provide any specific debug output or dynamic debugging tool.

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Hardware random drivers and framework are available here[4].

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Code examples are directly available from rng-tools[3] github.

9 References

- https://bootlin.com/doc/legacy/accessing-hardware/accessing-hardware.pdf
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Random Number Generator

System File System (See https://en.wikipedia.org/wiki/Sysfs for more details)

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Device Tree

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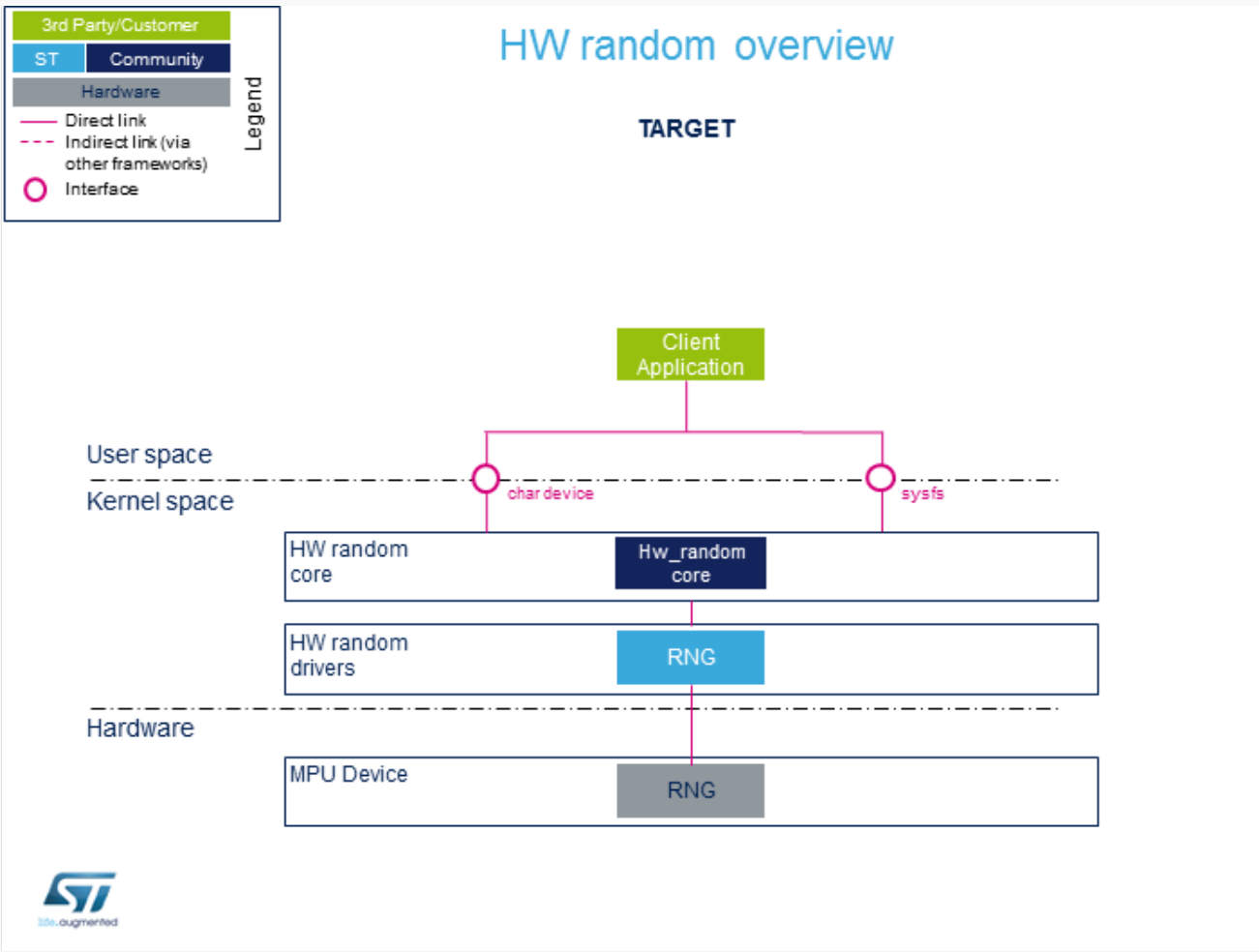

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Random Number Generator

System File System (See https://en.wikipedia.org/wiki/Sysfs for more details)

Application programming interface

Device Tree

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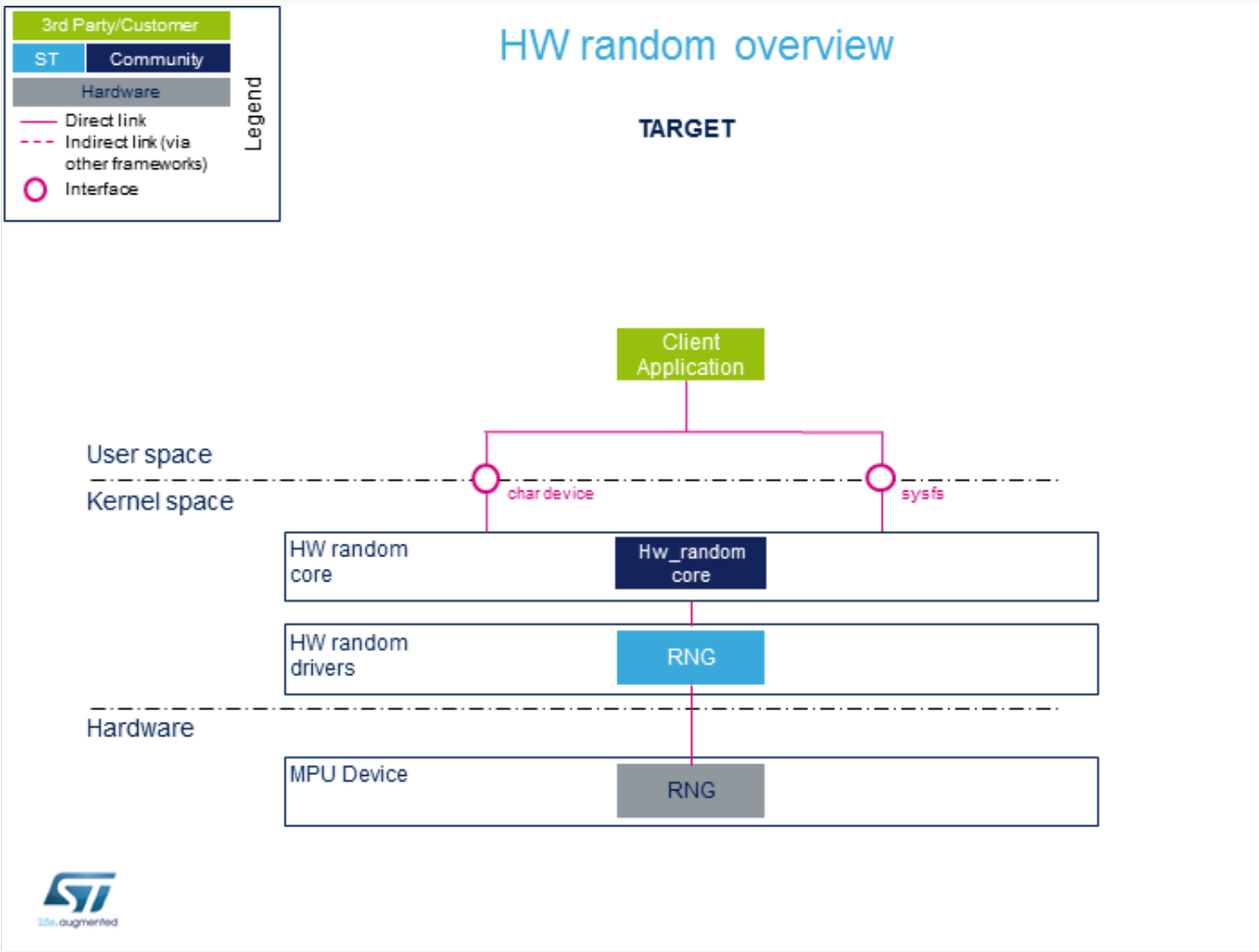

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Random Number Generator

System File System (See https://en.wikipedia.org/wiki/Sysfs for more details)

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Device Tree

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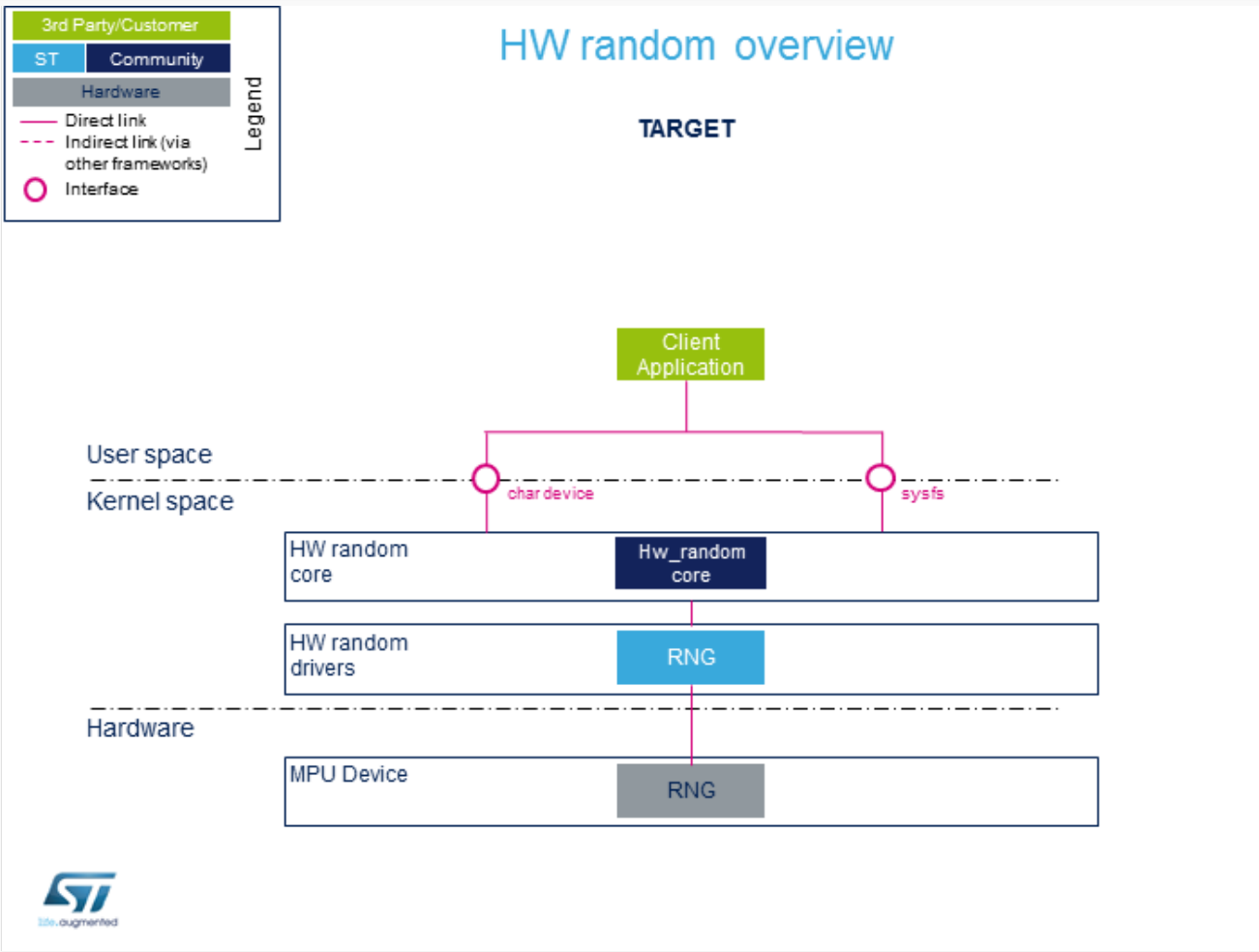

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Random Number Generator

System File System (See https://en.wikipedia.org/wiki/Sysfs for more details)

Application programming interface

Device Tree

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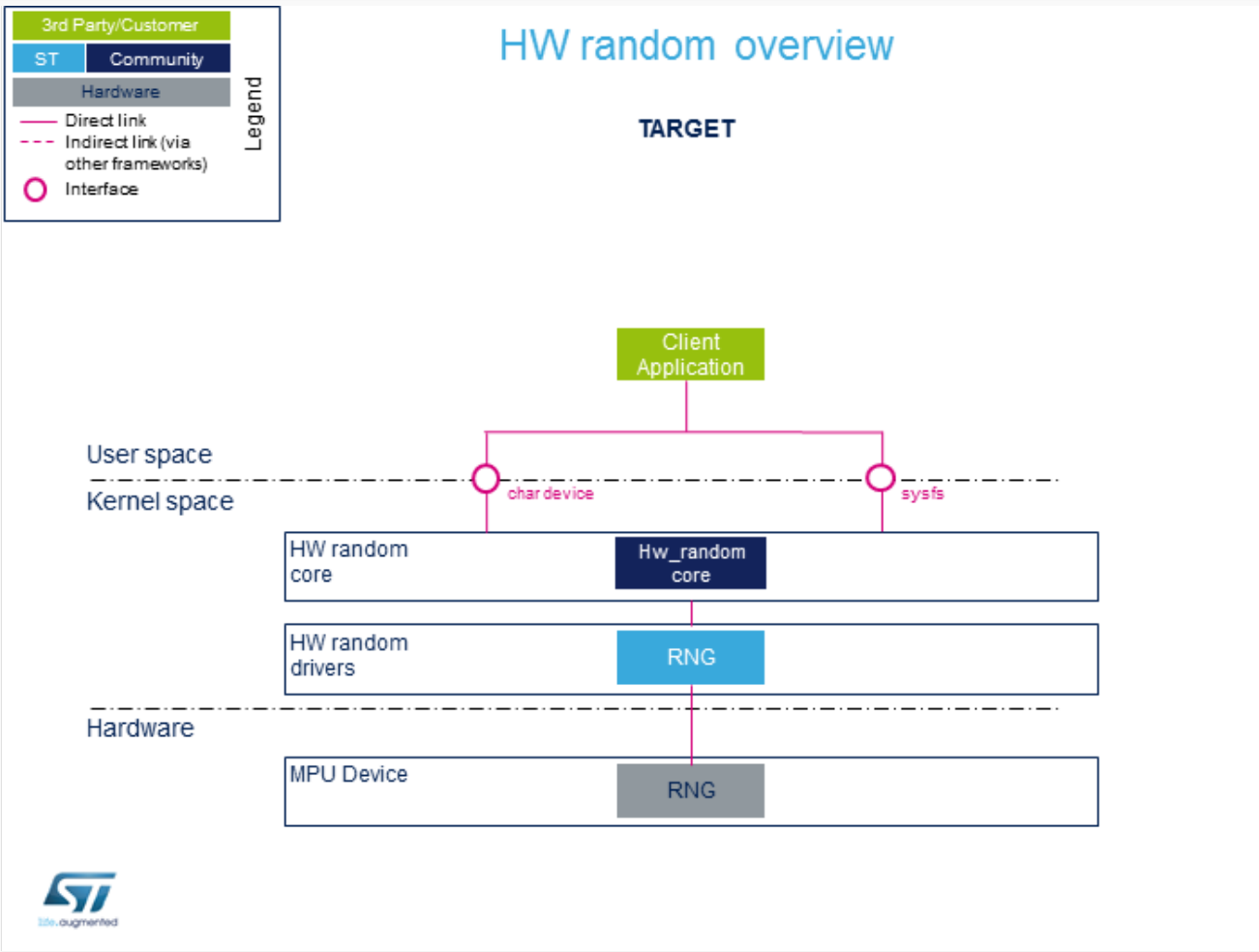

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