



# Arm RAN Acceleration Library

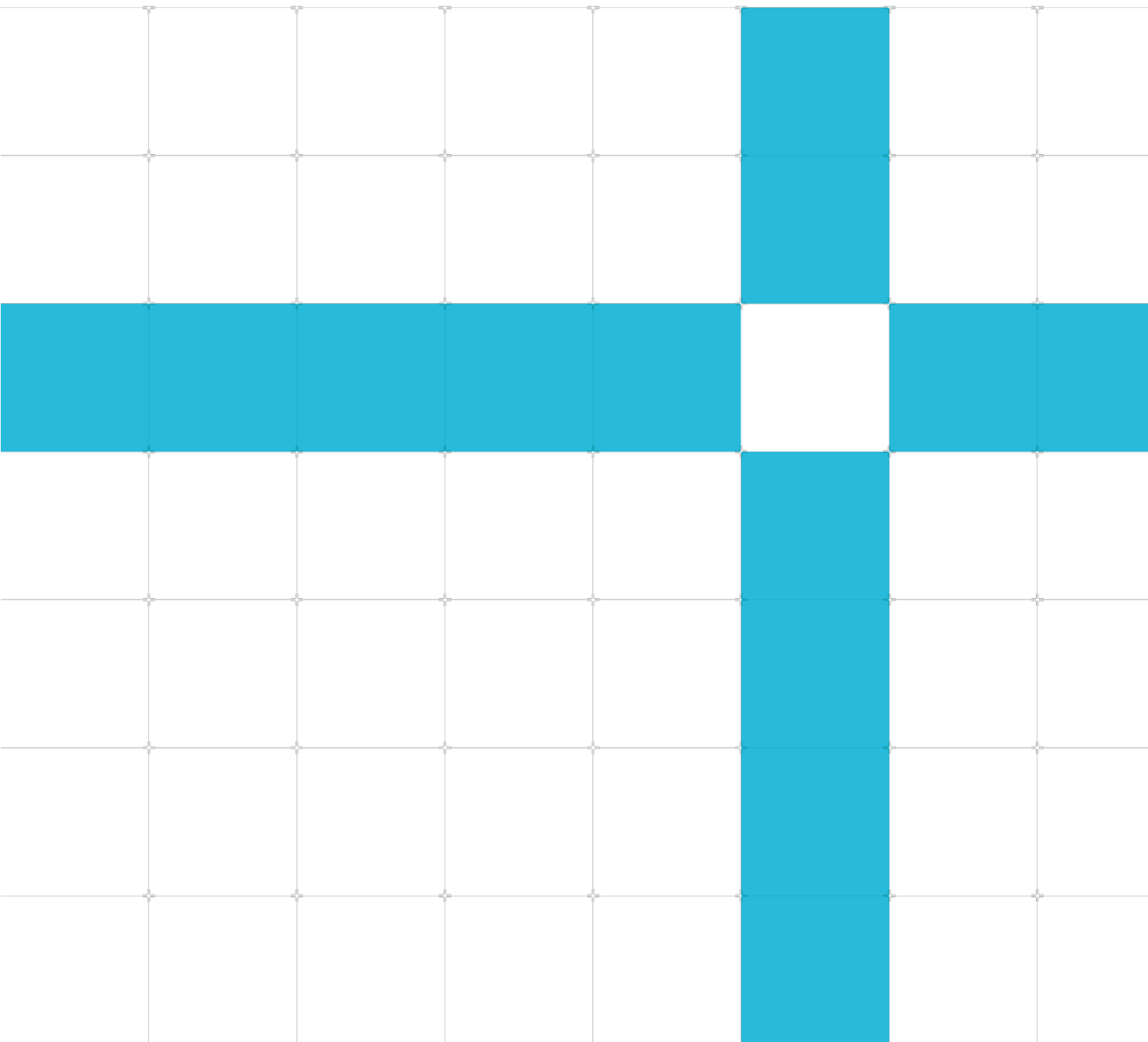
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## Release Note

Non-Confidential

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## Arm RAN Acceleration Library Release Note

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## Product status

The information in this document is Final, that is for a developed product.

## Feedback

Arm welcomes feedback on this product and its documentation. To provide feedback on Arm RAN Acceleration Library, create a ticket on <https://support.developer.arm.com>.

To provide feedback on the document, fill the following survey:  
<https://developer.arm.com/documentation-feedback-survey>.

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# 1 Release overview

The following sections describe the product that this release note describes and its quality status at time of release.

## 1.1 Product description

The Arm RAN Acceleration Library (ArmRAL) contains a set of functions for accelerating telecommunications applications such as, but not limited to, 5G Radio Access Networks (RANs). These functions are optimized for Arm AArch64-based processors.

Arm RAN Acceleration Library provides:

- Vector functions
- Matrix functions
- Lower physical layer (Lower PHY) support functions
- Upper physical layer (Upper PHY) support functions
- Distributed Unit – Radio Unit (DU-RU) Interface support functions

Arm RAN Acceleration Library includes functions that operate on 16-bit signed integers and 16-bit and 32-bit floating-point values.

## 1.2 Release status

This is the 24.04 release of Arm RAN Acceleration Library.

These deliverables are being released under the terms of the agreement between Arm and each licensee (the "Agreement"). All planned verification and validation is complete.

The release is suitable for volume production under the terms of the Agreement.

## 1.3 Licensing information

Use of Arm RAN Acceleration Library is subject to a BSD-3-Clause license, the text of which can be found in the `LICENSE.md` file in your product installation. We will receive inbound contributions under the same license.

If you require a different license than BSD-3-Clause for compatibility with your end product, please get in contact.

## 2 Release contents

Arm RAN Acceleration Library releases contain documentation and source files.

The following sections describe:

- Cloning the product's git repository from Arm's Gitlab.
- The contents of this release.
- Any changes since the previous release.
- Any known issues and limitations that exist at the time of this release.

### 2.1 Cloning the source repository

To obtain the 24.04 release of Arm RAN Acceleration Library by cloning the repository via HTTPS:

```
git clone -b armral-24.04 https://git.gitlab.arm.com/networking/ral
```

### 2.2 Deliverables

The downloaded product includes the deliverables listed in this section.

- Arm RAN Acceleration Library 24.04
- Release Notes (this document)
- Documentation

Product documentation is available on the Arm Developer website at:

<https://developer.arm.com/documentation/102249/2404>



Documentation, errata and release notes might change between product releases. For the latest documentation bundle, check the product download page.



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## 2.3 Differences from previous release

The following subsections describe differences from the previous release of Arm RAN Acceleration Library.

### 2.3.1 Additions and functionality changes

Describes new features or any technical changes to features or components in this release.

- Extended `armral_cmplx_pseudo_inverse_direct_f32` and `armral_cmplx_pseudo_inverse_direct_f32_noalloc` to compute the regularized pseudo-inverse of a complex 32-bit matrix of size  $M$ -by- $N$  for the case where  $M$  and/or  $N == 1$ .
- Added a Makefile target `bench_excel_summary` to run the benchmarks and create an Excel spreadsheet containing the results.

### 2.3.2 Performance improvements

Describes any features or components whose performance has improved in the current release compared with the previous release.

- Performance improvements for SVE2 implementations of the following routines:
  - `armral_turbo_decode_block` and `armral_turbo_decode_block_noalloc`. These functions now operate internally on 16-bit floating point values rather than 32-bit floating point values.
  - `armral_ldpc_encode_block` and `armral_ldpc_encode_block_noalloc`.

### 2.3.3 Changes to simulation programs

Describes any changes, new features or components added to the channel simulation programs in this release.

- There are no changes to the channel simulation programs in this release.

### 2.3.4 Resolved issues

Describes any known issues resolved in the current release.

- There are no known issues resolved in this release.

## 2.4 Known limitations

Describes any known limitations of the current release.

- There are no known limitations in this release.

## 3 Support

If you have any issues with the installation, content, or use of this release, raise a question on the Developer Community Forum <https://community.arm.com/developer/f/infrastructure-solutions>. Arm will respond as soon as possible.



Support for this release of the product is only provided by Arm to partners who have a current support and maintenance contract for the product.

### 3.1 Tools

To build or run Arm RAN Acceleration Library you will need:

- A C/C++ compiler, such as GCC. Arm RAN Acceleration Library has been tested with GCC 7.5.0, 8.5.0, 9.5.0, 10.5.0, 11.4.0, 12.3.0, and 13.2.0.



If you are cross-compiling, you need a cross-toolchain compiler that targets AArch64. You can download open-source cross-toolchain builds of the GCC compiler on the Arm Developer website:

<https://developer.arm.com/tools-and-software/open-source-software/developer-tools/gnu-toolchain/gnu-a/downloads>

The variant to use for an AArch64 GNU/Linux target is `aarch64-none-linux-gnu`.

- CMake version 3.3.0 or higher.

Additionally:

- To run the benchmarks, you must have the Linux utility tool `perf` installed and a recent version of Python 3. Arm RAN Acceleration Library has been tested with Python 3.8.5.
- To build a local version of the documentation, you must have Doxygen installed. Arm RAN Acceleration Library has been tested with Doxygen version 1.8.17.
- To generate code coverage HTML pages, you must have `gcovr` installed. The library has been tested with `gcovr` version 4.2.



Arm RAN Acceleration Library runs on AArch64 cores, however to use the convolutional encoder, CRC, and sequence generator functions, you must run on a core that supports the AArch64 PMULL extension. If your machine supports the PMULL extension, `pmull` is listed under the "Features" list given in the `/proc/cpuinfo` file.



## 4 Release history

A full release history (with release notes) for Arm RAN Acceleration Library is available on the Arm Developer website:

<https://developer.arm.com/downloads/-/arm-ran-acceleration-library/previous-releases-of-the-arm-ran-acceleration-library>

# 5 Conventions

The following subsections describe conventions used in Arm documents.

## 5.1 Glossary

The Arm Glossary is a list of terms that are used in Arm documentation, together with definitions for those terms. The Arm Glossary does not contain terms that are industry standard unless the Arm meaning differs from the generally accepted meaning.

See the Arm Glossary for more information: <https://developer.arm.com/glossary>.