ARM The Architecture for the Digital World®

NEON

The ARM® NEON™ general-purpose SIMD engine efficiently processes current and future multimedia formats, enhancing the user experience.

NEON technology can accelerate multimedia and signal processing algorithms such as video encode/decode, 2D/3D graphics, gaming, audio and speech processing, image processing, telephony, and sound synthesis by at least 3x the performance of ARMv5 and at least 2x the performance of ARMv6 SIMD.

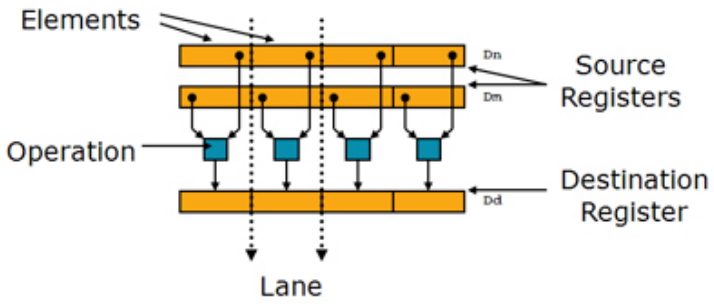
NEON™

Cleanly architected NEON technology works seamlessly with its own independent pipeline and register file.

NEON technology is a 128-bit SIMD (Single Instruction, Multiple Data) architecture extension for the ARM Cortex™-A series processors, designed to provide flexible and powerful acceleration for consumer multimedia applications, delivering a significantly enhanced user experience. It has 32 registers, 64-bits wide (dual view as 16 registers, 128-bits wide.

NEON instructions perform "Packed SIMD" processing:

- Registers are considered as **vectors** of **elements** of the same **data type**
- Data types can be: signed/unsigned 8-bit, 16-bit, 32-bit, 64-bit, single precision floating point
- Instructions perform the same **operation** in all **lanes**



The ARM Cortex™-A series processors with NEON technology, as well as ARM's Mali multimedia hardware solutions are used in multimedia applications ranging from smartphones and mobile computing devices to HDTV.

Why NEON? NEON Applications NEON Ecosystem Resources

How to use NEON

OpenMAX DL library:

- Recommended approach to accelerate AV codecs
- Libraries released in source form, free-of-charge from the ARM website
- Supports the following formats: MPEG-4 simple profile, H.264 baseline, JPEG, MP3, AAC
- Supports the following functions: FIR, IIR, FFT, Dot Product, Color space conversion, de-blocking.de-ringing, rotation, scaling, composition

Vectorizing compilers:

- Exploits NEON SIMD automatically with existing source code
- Supported by ARM RealView Development Suite (v3.1 Pro and later)
- Supported by gcc in versions 2007q3 and later

C intrinsics:

- C function interface to NEON operations
- Functions supported by NEON
- Supported in ARM's RealView Development Suite (version 3.1 and later) and gcc version 2007q3 and later

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- For those who really want to optimize at the lowest level
- Supported in ARM's RealView Development Suite (version 3.1 and later) and gcc version 2007q3 and later

NEON Support in the Open Source Community

NEON is currently supported in the following Open Source projects:

- Android - NEON optimizations
  Skia library, S32A_D565_Opaque is 5x faster using NEON
- Ubuntu 09.04 support NEON:
  NEON versions of critical shared libraries
- Bluez - official linux Bluetooth protocol stack
  NEON SBC audio encoder
- Pixman (part of Cairo 2D graphic library)
  Compositing/alpha blending
  X.Org, Mozilla Firefox, Fennec and Webkit browsers
  eg fbCompositeSolidMask_nx8x0565neon is 8x faster using NEON
- ffmpeg - libavcodec
  LGPL media player used in many Linux distributions
  Video: MPEG-2, MPEG-4ASP, H.264 (AVC), VC1
  Audio: Ogg Vorbis
- x264 - Google Summer of Code 2009
  GPL h.264 encoder - eg for video conferencing

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NEON technology is supported by the industry's largest network of Partners – the ARM Connected Community. Leading silicon, systems, design support and software providers come together to provide a complete and optimized solution for products based on NEON technology.

	Application
	H.264, VC1, MPEG-4
on2 technologies	VP6/7, MPEG-4, VC1, H.264, video stabilization

Company	Application
Ittiam	MPEG-4, MPEG-2, H.263, H.264, WMV9, VC1
ARICENT GROUP	MPEG-4, H.263, H.264, WMV9, audio
TATA ELXSI LIMITED	H.264, VC1
SPIRIT DSP	TEAMSpirit voice and video
VisualOn	H.264, MPEG-4, H.263, WMV
ACTIMAGINE	MobiClip
Fraunhofer IIS	Video and audio codecs
DOLBY	Multichannel audio processing
ESPIOO	MPEG-4
	Audio and consulting

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Training

ARM NEON Programming and Optimization

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