ARM®

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Adaptive Digital's focus on the ARM processors is in the embedded voice applications space.

ARM Architecture Overview / Index

ARM IS A FAMILY OF INSTRUCTION SET ARCHITECTURES FOR COMPUTER PROCESSORS BASED ON A REDUCED INSTRUCTION SET COMPUTING (RISC) ARCHITECTURE. ARMV7A ARCHITECTURE SUPPORTS A 32-BIT ADDRESS SPACE AND 32-BIT ARITHMETIC;ARMV8-A ARCHITECTURE ADDS SUPPORT FOR A 64-BIT .

Products	Platform
HD-Acoustic Echo Cancellation	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M3/M4/M7/M23/M33
MM-Acoustic Echo Cancellation	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M4/M7/M23/M33
G.168 Line, Network, Packet	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M4/M7/M23/M33, ARM9E, & ARM11
G.711 Appendix 1 and 2	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M4/M7/M23/M3, ARM9E, & ARM11
G.729, G.729AB, G.729A	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M3/M4/M7/M23/M33, ARM9E, & ARM11
G.729B, H/I, D/F, E/G	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73
G.722 PLC*/Annnex IV	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M3/M4/M7/M23/M33 , ARM9E, & ARM11
G.722.1	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M3/M4/M7/M23/M33
G.723.1	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M3/M4/M7/M23/M33
G.722.2	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, ARM9E, & ARM11
G.726	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73
VAD-CNG	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M3/M4/M7/M23/M33, ARM9E, & ARM11
DTMF	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M3/M4/M7/M23/M33
AGC	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M3/M4/M7/M23/M33, ARM9E, & ARM11
iLBC	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M3/M4/M7/M23/M33
Opus	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M4/M7/M23/M33
Conference	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M3/M4/M7/M23/M33, ARM9E, & ARM11
Noise Reduction-G2	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73
MELPe	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M4/M7/M23/M33, ARM9E, & ARM11
CVSD	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, ARM9E, & ARM11
Speex	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M3/M4/M7/M23/M33, ARM9E, & ARM11
Caller ID	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73
Receiver Off Hook Detect	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73
RIF / IIF	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73
Signal Gain and Summing	ARM9E, & ARM11
SIP	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M3/M4/M7/M23/M33 , ARM9E, & ARM11
AES	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, ARM9E, & ARM11
RTP	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M3/M4/M7/M23/M33, ARM9E, & ARM11
RTCP	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, Cortex-M3/M4/M7/M23/M33
SRTP	Cortex-A8/A9/A15/A17/A32/A35/53/57/A72/A73, ARM9E, & ARM11
VoIP Engine	Voice Engine for ARM Devices
AnVoice	Voice Engine for Android / ARMv7A
iPVoice	Voice Engine for Apple iOS
LnxVoice	Voice Engine for Linux / ARMv7A

* PLC - Packet Loss Consealment

Today, ARM is no longer an acronym, but it instead refers to ARM Holdings, the company, as well as to the ARM CPU architecture. Acorn Computer, the originator of the ARM architecture is no longer in existence. Many of its former Subsidiaries, including ARM Holdings, are still in existence.

It should be noted that we refer to ARM as a family of CPU architectures rather than a family of CPUs. The reason is that the ARM architecture is a design, not a set of chips. The ARM architecture is licensed to chip

manufacturers who then design microprocessors, microcontrollers, and SOCs (Systems On a Chip) that incorporate one of the ARM architectures.

The ARM has evolved over the years with many incremental improvements to the architecture. The first ARM architecture was a 32-bit RISC machine with a minimal instruction set. Enhancements that occurred over the years include:

- Thumb Instruction Set The thumb instruction set reduces program size by using 16-bit op-codes rather than 32 bit op-codes. Many ARM processors support both the standard 32-bit ARM instructions and the Thumb 16-bit instructions
- Thumb-2 Instruction Set: This is a super-set of the thumb instruction set, allowing more complex operations to be performed than the original thumb instruction set.
- Jazelle: CPUs that include Jazelle are able to run Java byte-code directly instead of using a Java Virtual Machine, which is much slower.
- DSP: Many DSP (Digital Signal Processing) instructions have been added to the architecture to speed up the execution of DSP algorithms such as voice and video processing.
- SIMD: Single Instruction, Multiple Data instructions speed up CPU intense operations by enabling some math operations to be done on multiple operands within the same instruction cycle.
- Floating Point Support
- NEON: Neon includes Advanced SIMD and floating point, including SIMD floating point.
- NVIC: The NVIC (Nested Vector Interrupt Controller) facilitates low-latency exception processing by speeding up context save/restore.

ARM ARCHITECTURES

The ARM naming conventions gets very confusing. There are processor names and architecture versions. Let's start with architecture versions because that is less confusing. The table below lists the ARM architectures along with the features that are typically included. We say "typically" because it is not a hard and fast rule. There are processors within an architecture family that do not include the same feature sets.

Architecture Version	ARM32	Thumb	Thumb2	DSP	Jazelle	SIMD	Float	NEON
ARMv5	x	x						
ARMv5E	x	X		x	x			
ARMv6	x	x	x	x	x			
ARMv6M	x	x	x	x	x			
ARMv7A	x	x	x	x	x	x	x	x
ARMv7M	x	x	x	x				
ARMv7MF	x	x	x	x			x	
ARMv7R	x	x	x	x				
ARMv7RF	x	x	x	x			x	

The newer architectures tend to be of the most interest since they are the ones that are used in current designs. So it is useful to focus on the ARMv7 architecture a bit more. As you can see from the table above, there are many variations of the ARMv7 architecture. In ARM lingo, these variations are called profiles. The profiles include:
A Profile (ARMv7A) – also known as Cortex-A series. This series is targeted as an application processor. It is designed to handle high end operating systems such as Linux and Windows Embedded. It is used extensively in the Android space. The Cortex-A can be found in many smart phones and tablets including most Android and Apple products. The Cortex-A series of processors has the most computation power of any of the ARM processors to date.
M Profile (ARMv7M) – also known as the Cortex-M3 and Cortex-M4 series. These processors are targeted at low-cost, low-power, embedded applications.
R Profile (ARMv7-R) – also known as Cortex-R series. This series is targeted at high-performance real-time control such as computer controlled braking systems and hard drive controllers.

ARM PROCESSORS

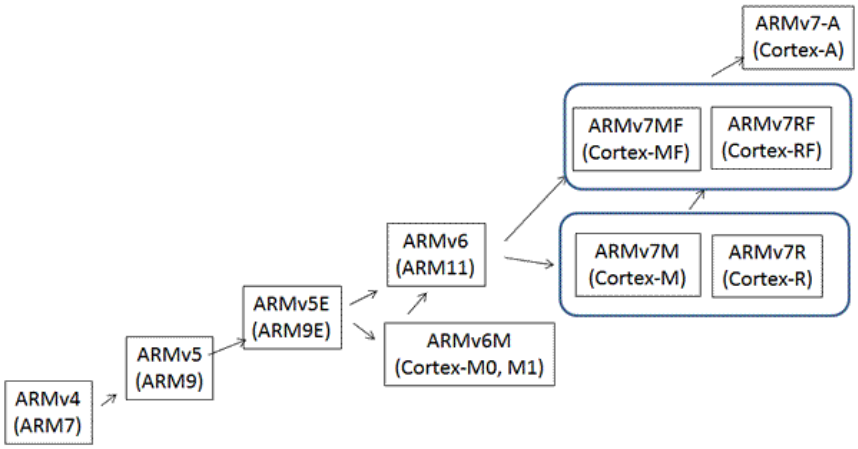
Although we hesitate to confuse the reader, this discussion would not be complete without talking about the processors within the various architectures. The confusion comes about because there are ARM processor numbers as well as ARM architecture versions, and the numbering schemes between the two have some overlap. . For example, ARM7 is a processor and ARMv7 is an architecture. ARM7 is based upon the ARMv4 architecture. Without further explanation, the table below is a partial listing of ARM processors.

Processor Name	Architecture Version	Features (partial list)
ARM6TDMI	ARMv4T	
ARM920T, ARM922T	ARMv4T	
ARM926EJ-S	ARMv5E	DSP, Jazelle
ARM946E-S	ARMv5E	DSP, Jazelle
ARM1136J-S	ARMv6	DSP, Jazelle

ARM1156T2-S	ARMv6	DSP
Cortex-M0	ARMv6M	NVIC
Cortex-M1	ARMv6M	NVIC
Cortex-M3	ARMv7M	NVIC
Cortex-R4	ARMv7R	DSP
Cortex-R4F	ARMv7R	DSP, floating point
Cortex-A8	ARMv7A	DSP, Jazelle, NEON + floating point
Cortex-A9	ARMv7A	DSP, Jazelle, NEON + floating point, multiprocessor
Cortex-A15	ARM-v7A	DSP, Jazelle, NEON + floating point, multiprocessor

Instruction Set Compatibility

Getting back to things that are a bit less confusing, the diagram below shows how software can be migrated forward as a result of instruction set compatibility.



Adaptive Digital's focus on the ARM processors is in the voice and video space. We offer our usual speech compression, echo cancellation, telephony, voice quality, and VoIP protocols for use on many ARM processors. Furthermore, we have developed an integrated VoIP Engine that runs on the ARM. It is used primarily in iPhone, iPad, iPod, and Android smart phones and tablets.