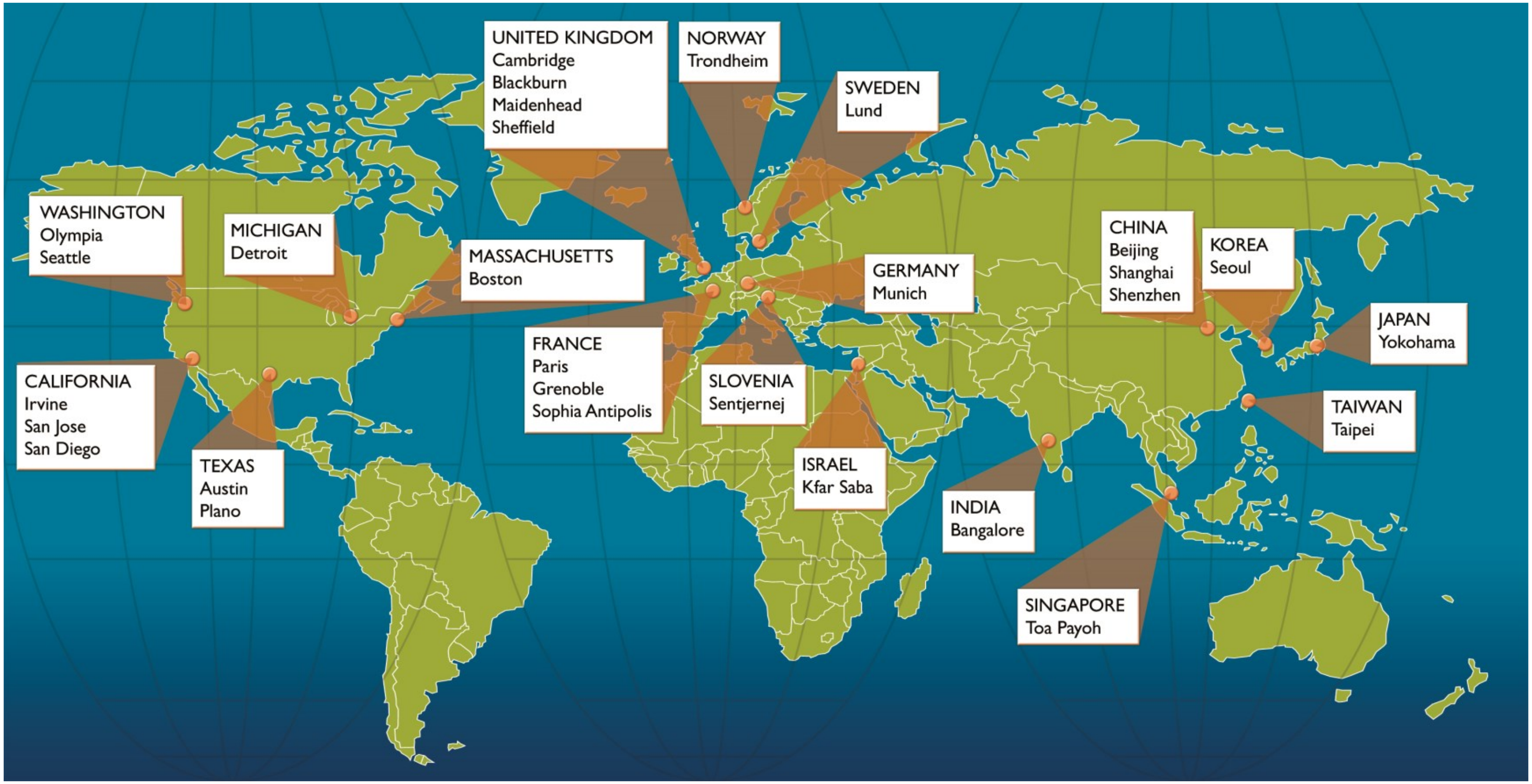
ARM

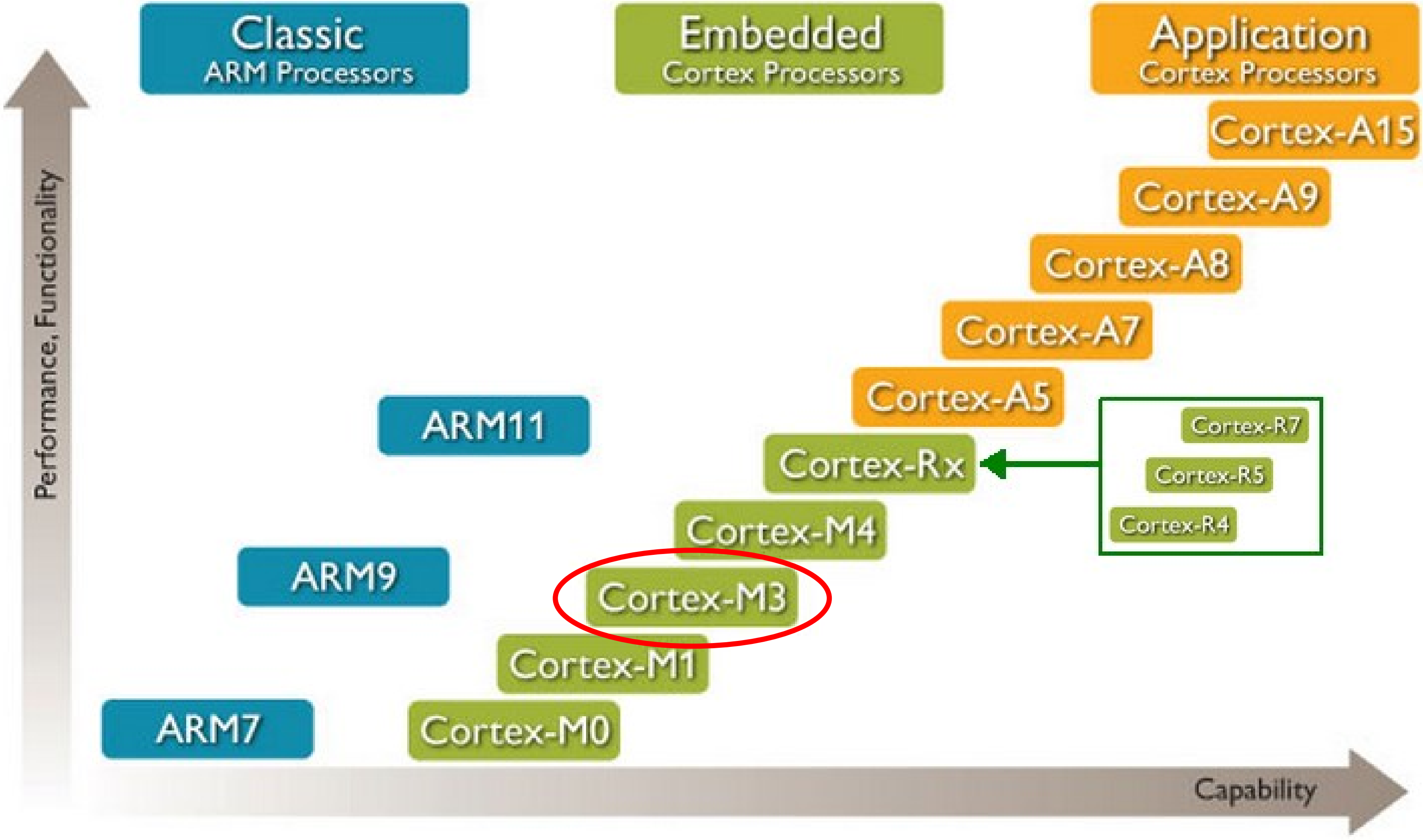
Advanced RISC Machines

Applications & Tools

ARM Offices Worldwide



ARM Processors



infineon
ST
NXP
intel
XILINX
ALL PROGRAMMABLE.

cādence
Mentor
A Siemens Business
SYNOPSYS
Silicon to Software
IBM

Windows Embedded
ubuntu
redhat
Green Hills
SOFTWARE
vmware
KEIL
Tools by ARM

ARM Powered products

ARM world

- ARM architecture embedded in System-on-chip (SoC)
- ARM Operating Systems
- ARM Compile – Support – Debug tools

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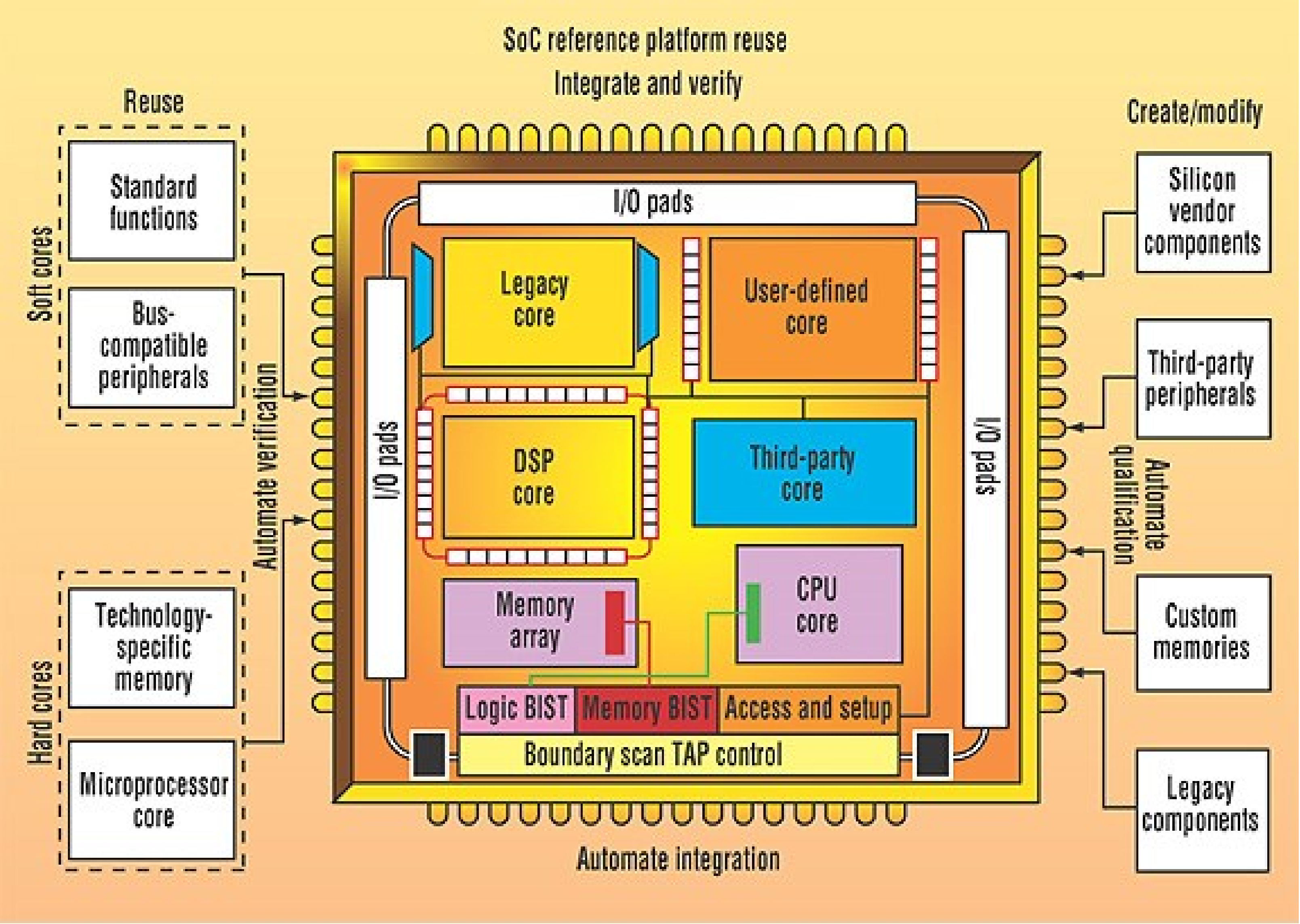
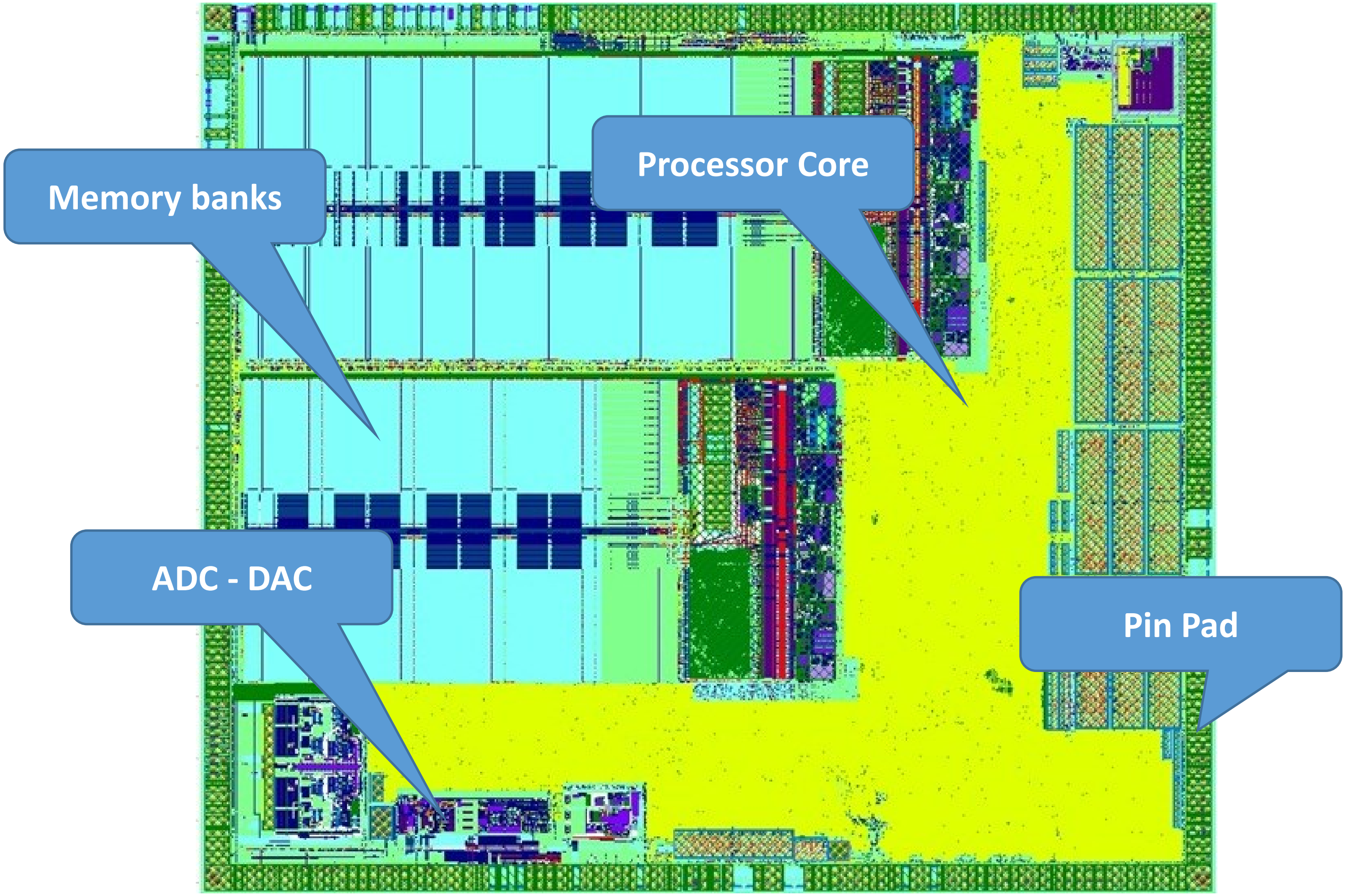


1. This diagram shows a usual SoC derivative built from a reuse platform in which over 70% of the design content could come from reuse.

SoC layout example



ARM-based commercial SoCs

- *NXP:*
  - https://www.nxp.com/products/processors-and-microcontrollers:MICROCONTROLLERS-AND-PROCESSORS#/
  - https://www.nxp.com/products/processors-and-microcontrollers/arm-microcontrollers/general-purpose-mcus/lpc1700-cortex-m3/512-kb-flash-64-kb-sram-ethernet-usb-lqfp100-package:LPC1768FBD100
- *STMicroelectronics:* http://www.st.com/mcu/
  - http://www.st.com/mcu/contentid-34-86-STR710_EVAL.html
- …and many others…

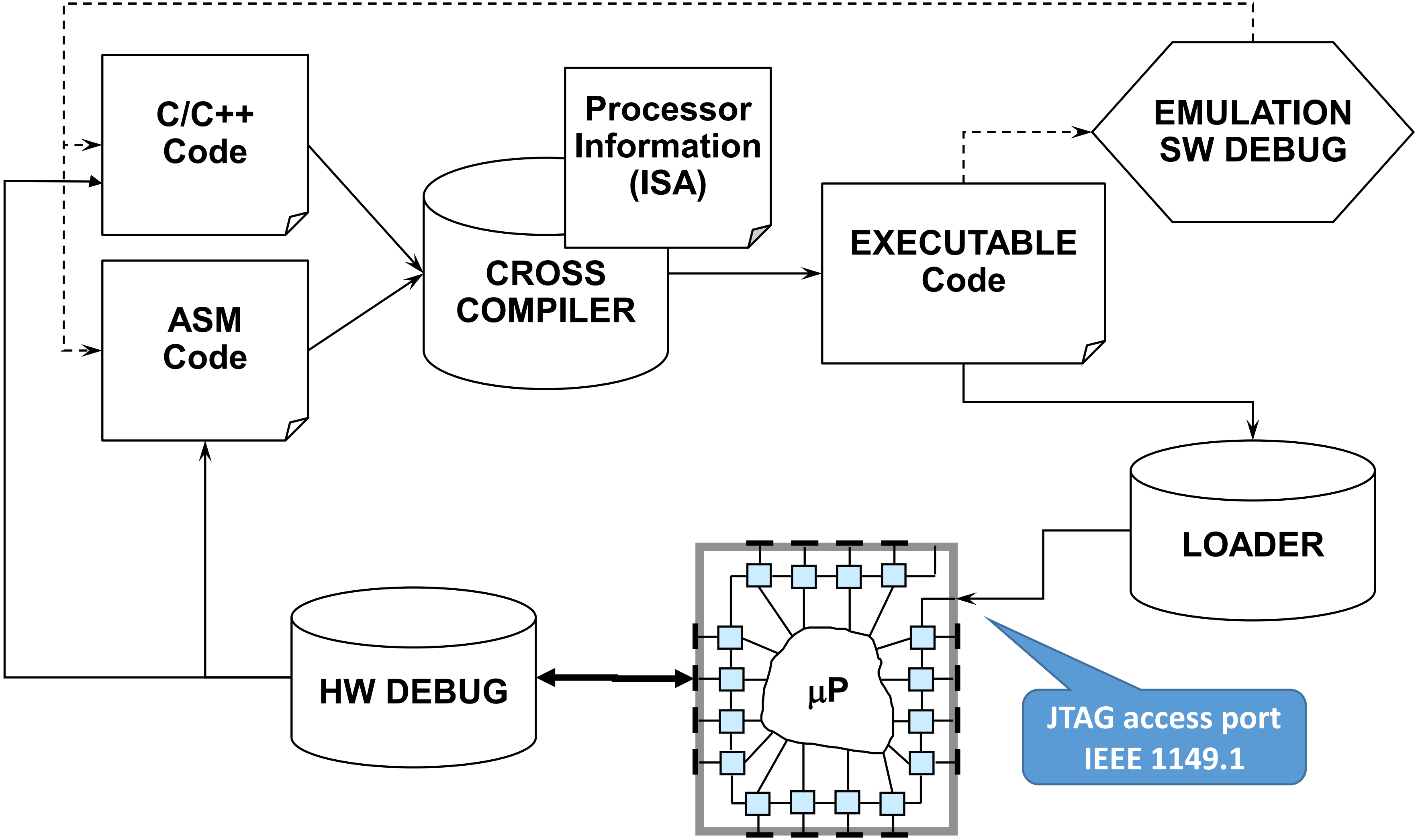
ARM compliant
Operating Systems

- Microsoft Windows CE: http://www.microsoft.com/presspass/press/2002/sep02/09-18armsummitpr.mspx (old news removed)
- Linux: *many releases*
  - http://www.debian.org/ports/arm/
  - plenty of kernel to be customized
  - WIKI for problem solving

All of them requires a *bootloader* to be launched

Das U-Boot:
http://sourceforge.net/projects/u-boot/

Tool chain



JTAG access port
IEEE 1149.1

ARM Tool chain

- CROSS-COMPILATION/EMULATION/SW DEBUG
  - WINDOWS: http://www.keil.com/
  - LINUX: http://www.codesourcery.com/gnu_toolchains/arm
- LOADING TOOLS
  - Ad-hoc tools released with products:
    - http://www.keil.com/
  - Generic and customizable tools
    - OPENWINCE: http://openwince.sourceforge.net/
- HW DEBUG TOOLS
  - Based on internal debug structures such as ***Embedded ICE***
    - http://infocenter.arm.com/help/index.jsp?topic=/com.arm.doc.dai0201a/index.html

Based on IEEE 1500 HW structures

What do we learn in this part of the course

- ARM assembly principles
  - Instruction Set Architecture
  - C + ASM programming by following ABI standards
  - System-on-Chip level programming including
    - Peripheral management
    - clock and power modes management
- Internal, SW and HW interrupts management
  - Exceptions due to unexpected execution flaws
  - SW interrupts towards system call understanding
  - HW interruptions
    - Possible sources of hw interrupt including internal modules (i.e., timers) and external evants (i.e., button pression)
    - Interrupt controller behavior
- Extended system on-board features.

Case of study

ARM V7-M Architecture

- **Landtiger board**
  - Based on a NXP system-on-chip **LPC1768** including an ARM 32-bit Cortex-M3 Microcontroller with a full set of on-chip peripheral cores
  - Mounting several additional devices and connectors on board
- KEIL uVision software
  - Trial version with 32K code limitation
  - Full use of the debugging features
  - Very accurate timing calculation
- HW debug enabled by an additional component called real-view, which implements a ULINK2 jtag based connection.

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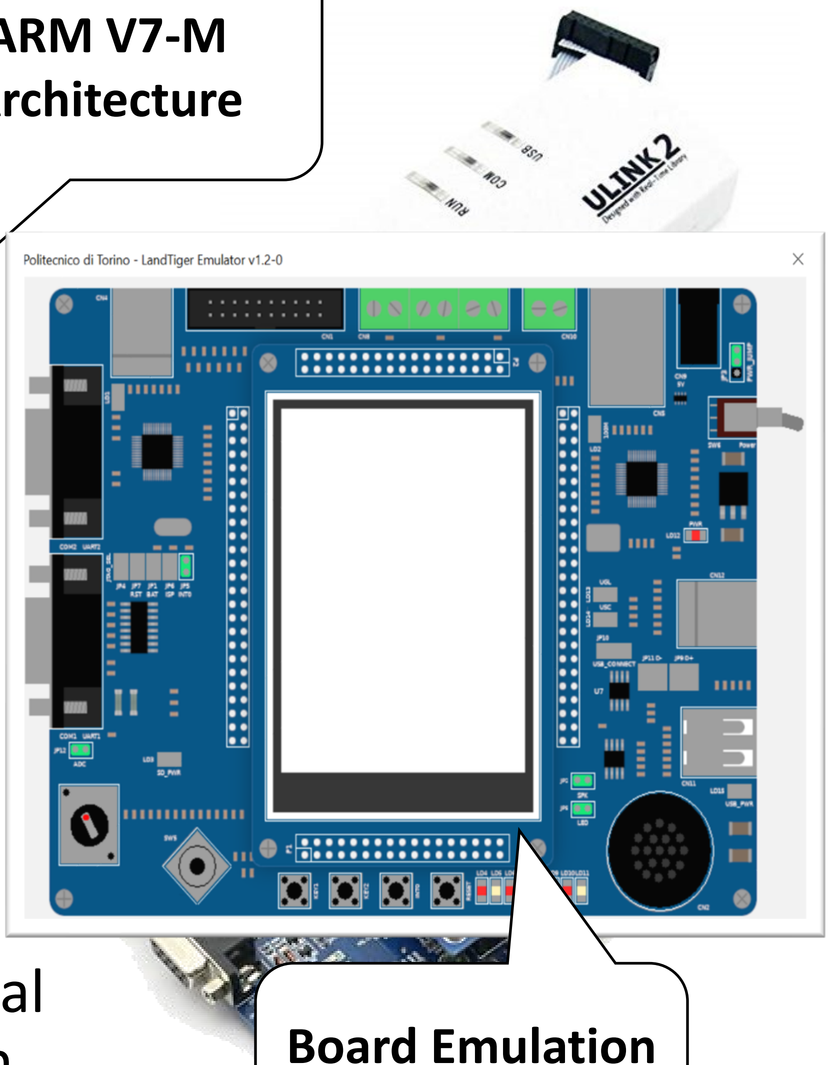

Politecnico di Torino - LandTiger Emulator v1.2-0

Board Emulation system