



## TK1 - KEYSTONE II IMPLEMENTATION

*This course covers all SoCs belonging to the KeyStone II, AM5K2E, 66AK2H and 66AK2E*

### OBJECTIVES

- The course details the hardware implementation of the Key Stone II.
- The course focuses on the boot sequence, the clocking and the power management strategies.
- The course explains all parameters that affect the performance of the system in order to easily perform the final tuning.
- The Ethernet MACs, as well as the Queue Manager and the Network Coprocessor are detailed.
- Interrupt management through ARM GIC is explained through a lab.
- The course also covers the hardware implementation, particularly the power supplies and the clocking
- All operation modes of EDMA3 are studied through use cases.
- General purpose high speed interfaces PCIe and USB3.0 are also handled.

A more detailed course description is available on request at [training@ac6-training.com](mailto:training@ac6-training.com)

### Prerequisites and related courses

- The Cortex-A15 ARM CPU is studied in a separate course.
  - See Cortex-A15 implementation and NEON programming cours [RA3 - Cortex-A15 implementation](#).
- The following courses could also be of interest:
  - PCIe cours [IC4 - PCI Express 3.0](#)
  - Gigabit Ethernet cours [N1 - Ethernet and switching](#)
  - USB 3.0 cours [IP3 - USB 3.0](#)

### Environnement du cours

- Cours théorique
  - Support de cours au format PDF (en anglais) et une version imprimée lors des sessions en présentiel
  - Cours dispensé via le système de visioconférence Teams (si à distance)
  - Le formateur répond aux questions des stagiaires en direct pendant la formation et fournit une assistance technique et pédagogique
- Au début de chaque demi-journée une période est réservée à une interaction avec les stagiaires pour s'assurer que le cours répond à leurs attentes et l'adapter si nécessaire

### Audience visée

- Tout ingénieur ou technicien en systèmes embarqués possédant les prérequis ci-dessus.

# Plan du cours

## ARCHITECTURE OF KEY STONE II

- Describing the architectures of AM5K2E, 66AK2H, 66AK2E SoCs
- On-chip memories
- Clarifying the internal data paths: TeraNet masters and slaves
- Memory Protection Unit
- Organization of a board based on Key Stone II
- Summary of all peripheral features
- Memory mapping

## ARM COREPAC

- Cortex-A15 and integrated L2 cache instantiation options
- Integrated interrupt controller (GIC), detail of interrupt mapping
- Hardware big/little endian conversion
- Local Power and Sleep Controller
- Debug architecture
- Introduction to CoreSight, DAP features
- System Secure Controller SJC
- Embedded Trace Macrocell

## HARDWARE IMPLEMENTATION

- Power supplies, smart reflex
- Clock Control Module
- Reset Controller
- General Purpose Input/Output pins
- SerDes

## EDMA3 CONTROLLER

- DMA/QDMA Channel Logic
- Transfer controller, types of transfers
- Event queues
- Transfer Request Submission Logic
- Channel priority definition
- DMA/QDMA Channel Logic
- Parameter RAM (PaRAM):
  - Linking transfers
  - Channel controller shadow regions

## ACCESSING EXTERNAL MEMORIES

- DDR3 Controller
- EMIF16

## PCIe CONTROLLER

- Configuration as Agent or Root Complex
- Interrupt management, MSI
- Error management
- Configurable BAR filtering

- Inbound and outbound window programming
- Power management

## **COMMUNICATION CONTROLLERS**

- Enhanced CSPI
- I2C interfaces
- UART
- USB 3.0
- 1G/10G Ethernet Controller
- Ethernet switch
- Multicore Navigator
- Network coprocessor