

## P4 - CoreConnect

**This course covers the CoreConnect specification, explaining PLB, OPB, DCR buses and bridges**

### Objectives

- The course describes the 3 buses specified by the IBM CoreConnect specification : PLB, OPB and DCR.
- It explains also the operation of bus bridges PLB-to-OPB and OPB-to-PLB.
- All parameters of the Xilinx CoreConnect infrastructure logiccores are described in detail.
- Labs have been developed to become familiar with the simulation toolkit : Bus Functional Models (BFM) and CTG (CoreConnect Test Generator).
- The course focuses on bus error recovery through syndrome registers.
- 128-bit PLB, also known as PLB4, is fully covered including 2-way crossbar implementation.
- The course explains how to tune programmable parameters through the PLB performance monitor.

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- This training has been delivered several times to engineers developing ASICs based on Power cores and to engineers developing SoCs based on Xilinx FPGAs containing Power cores.

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

### Prerequisites

- Experience of a parallel digital bus is mandatory.

### Course Environment

- Theoretical course
  - PDF course material (in English) supplemented by a printed version for face-to-face courses.
  - Online courses are dispensed using the Teams video-conferencing system.
  - The trainer answers trainees' questions during the training and provide technical and pedagogical assistance.
- At the start of each session the trainer will interact with the trainees to ensure the course fits their expectations and correct if needed

### Target Audience

- Any embedded systems engineer or technician with the above prerequisites.

### Evaluation modalities

- The prerequisites indicated above are assessed before the training by the technical supervision of the trainee in his company, or by the trainee himself in the exceptional case of an individual trainee.
- Trainee progress is assessed by quizzes offered at the end of various sections to verify that the trainees have assimilated the points presented
- At the end of the training, each trainee receives a certificate attesting that they have successfully completed the course.
  - In the event of a problem, discovered during the course, due to a lack of prerequisites by the trainee a different or additional training is offered to them, generally to reinforce their prerequisites, in agreement with their company manager if applicable.

## Plan

### INTRODUCTION TO CoreConnect

- SoC organization
- Intellectual Property reuse by using common bus for inter-macro communication
- The IBM 3-bus for interconnecting cores : PLB, OPB and DCR
- Benefits of DCR compared to memory-mapped IOs
- The infrastructure cores developed by Xilinx

### THE PLB

- Arbitration
- Bus time-out detection
- Locked transfer
- Address pipelining capability
- Differences between a 1-deep and a N-deep ( $N > 2$ ) pipeline implementation
- Single data, burst and line transfer timing diagrams
- Read burst and write burst terminations
- Dynamic bus width adaptation
- PLB usage in Xilinx FPGAs
- The PLB Xilinx logicore

### FIXING BUS ERRORS

- Parity generation and checking
- Slave error report to masters
- Syndrome registers

### THE PLB PERFORMANCE MONITOR

- Use of the PPM to tune programmable parameters
- Event counting, duration measurement
- Connection of the PPM to the PLB fabric
- Pipeline stage usage tracking

### PLB ARBITRATION

- Central arbitration mechanism
- Fixed and rotative priority schemes
- PLB watchdog timer
- Programming interface
- Xilinx PLB arbiter operating modes

### THE 128-BIT 2-WAY CROSSBAR

- Concurrent read transactions and concurrent write transactions
- Highlighting address path, read data path and write data path
- Selecting the slave bus segment, PCBC register programming

### THE OPB

- Dynamic bus sizing vs Byte Enables
- Distributed multiplexing
- Arbitration
- OPB interface for master, slave, arbiter and DMAs
- Slave retry
- Logicore Xilinx OPB with OPB arbiter

- Connection to OPB through IPIF

### **THE PLB-to-OPB BRIDGE**

- Block diagram and data flows
- Internal data buffers structure
- PLB-to-OPB signals
- Bridge control registers
- Xilinx PLB-to-OPB bridge user configurable parameters
- Definition of address ranges allowing PLB masters to access the OPB bus

### **THE OPB-to-PLB BRIDGE**

- Block diagram and data flows
- Internal data buffers structure
- Synchronization with the PLB-to-OPB bridge
- Bridge control registers
- Xilinx OPB-to-PLB bridge user configurable parameters
- Definition of address ranges allowing OPB masters to access the PLB bus

### **THE DCR BUS**

- Features
- Bus operation : bypass mux use
- The DCR Xilinx logicore

### **SIMULATING CoreConnect BUSES**

- Description of the simulation tools provided by IBM Microelectronics : BFM and CTG
- Step-by-step explanation of the simulation flow
- Development of a testbench to test a PLB IP

## **Renseignements pratiques**

**Duration : 3 days**  
**Cost : 1650 € HT**