

Course Description

Learn how to employ serial transceivers in UltraScale™ and UltraScale+™ FPGA designs or Zynq® UltraScale+ MPSoC designs.

The focus is on:

- Identifying and using the features of the serial transceiver blocks, such as 8B/10B and 64B/66B encoding, channel bonding, clock correction, and comma detection
- Utilizing the Transceivers Wizards to instantiate transceiver primitives
- Synthesizing and implementing transceiver designs
- Taking into account board design as it relates to the transceivers
- Testing and debugging

Level – Connectivity 3

Course Duration – 2 days live instructor led training (in person or online)

Price – \$1,600 or 16 Xilinx Training Credits

Course Part Number – CONN-TRX

Who Should Attend? – FPGA designers and logic designers

Prerequisites

- HDL experience (or the [Designing with Verilog](#) or the [Designing with VHDL](#) training)
- Familiarity with logic design (state machines and synchronous design)
- Basic knowledge of [FPGA architecture](#) and Xilinx implementation tools are helpful
- Familiarity with serial I/O basics and high-speed serial I/O standards is also helpful

Software Tools

- [Vivado®](#) System Edition 2020.1
- Mentor Graphics Questa Advanced Simulator 10.7

Hardware

- Architecture: all UltraScale Architectures
- Demo board: Kintex® UltraScale FPGA KCU105 board or Zynq UltraScale+ MPSoC ZCU104 board*

* This course focuses on the UltraScale architecture. Check with [Morgan Advanced Programmable Systems, Inc.](#) for the specifics of the in-class lab board or other customizations.

After completing this comprehensive training, you will have the necessary skills to:

- Describe and use the ports and attributes of the serial transceivers in Xilinx FPGAs and MPSoCs
- Effectively use the following features of the gigabit transceivers:
 - 64B/66B and other encoding/decoding, comma detection, clock correction, and channel bonding
 - Pre-emphasis and receive equalization
- Use the Transceivers Wizards to instantiate GT primitives in a design
- Access appropriate reference material for board design issues involving signal integrity and the power supply, reference clocking, and trace design
- Use the IBERT design to verify transceiver links on real hardware

Course Outline

Day 1

- UltraScale, UltraScale+, Zynq UltraScale+ Device Transceivers Overview
- UltraScale, UltraScale+, Zynq UltraScale+ Device Transceivers Clocking and Resets
- Transceiver IP Generation – Transceiver Wizard
- **Lab 1:** Transceiver Core Generation
- Transceiver Simulation
- **Lab 2:** Transceiver Simulation
- PCS Layer General Functionality
- PCS Layer Encoding
- **Lab 3:** 64B/66B Encoding

Day 2

- Transceiver Implementation
- **Lab 4:** Transceiver Implementation
- PMA Layer Details
- PMA Layer Optimization
- **Lab 5:** IBERT Design
- Transceiver Test and Debugging
- **Lab 6:** Transceiver Debugging
- Transceiver Board Design Considerations
- Transceiver Application Examples
- Optional: Additional modules on Virtex® UltraScale+ FPGA GTM transceiver architecture and functionality

Lab Descriptions

- **Lab 1:** Transceiver Core Generation – Use the Transceivers Wizard to create instantiation templates.
- **Lab 2:** Transceiver Simulation – Simulate the transceiver IP by using the IP example design.
- **Lab 3:** 64B/66B Encoding – Generate a 64B/66B transceiver core by using the Transceivers Wizard, simulate the design, and analyze the results.
- **Lab 4:** Transceiver Implementation – Implement the transceiver IP by using the IP example design.
- **Lab 5:** IBERT Design – Verify transceiver links on real hardware.
- **Lab 6:** Transceiver Debugging – Debug transceiver links.

Register Today

Morgan Advanced Programmable Systems, Inc. (Morgan A.P.S.) delivers public and private courses in locations throughout the central US region; including Iowa, Illinois, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin.

Visit morgan-aps.com/training, for full course schedule and training information.



You must have your tuition payment information available when you enroll. We accept credit cards (Visa, MasterCard, or American Express) as well as purchase orders and Xilinx training credits.

Student Cancellation Policy

- Student cancellations received more than 7 days before the first day of class are entitled to a 100% refund. Refunds will be processed within 14 days.
- Student cancellations received less than 7 days before the first day of class are entitled to a 100% credit toward a future class.
- Student cancellations must be sent [here](#).

Morgan A.P.S. Course Cancellation Policy

- We regret from time-to-time classes will need to be rescheduled or cancelled.
- In the event of cancellation, live on-line training may be offered as a substitute.
- Morgan A.P.S. may cancel a class up to 7 days before the scheduled start date of the class; all students will be entitled to a 100% refund.
- Under no circumstances is Morgan A.P.S. responsible or liable for travel, lodging or other incidental costs. Please be aware of this cancellation policy when making your arrangements.
- For additional information or to schedule a private class contact us [here](#).

Online training with real hardware

During the Covid-19 period, some companies do not allow their staff to participate in live in-person training.

- Consequently, Morgan Advanced Programmable Systems, Inc. has set up a training VPN where engineer participants can take classes online using the same computers and devCards used during in-person training.
- Even better, and upon request, you can use these computers after hours on training days to experiment with labs. This is not possible for in-person training.
- Additionally, just like in-person training, the laptops and devCards, tools, OS, and licensing are set up in advance.
- In some ways, live online-training is better than in-person...for example, you can grant the instructor permission to look at your Vivado, PetaLinux terminal, or Vitis for extended periods of time if your lab is not going exactly as planned to a missed step.
- This is often more comfortable than two engineers crowding around a laptop screen.

Taking remote training also allows you to learn some tips and tricks for working remote. Whether your devCard is in the lab down the hall, or across the world via VPN, you can control your Xilinx based device quickly and efficiently.