

### Course Description

This course tackles the most sophisticated aspects of the Vivado® Design Suite and Xilinx hardware. This course enables you to use the advanced capabilities of the Vivado Design Suite to achieve design closure.

**Level** – FPGA 4

**Course Duration** – 2 days

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

**Course Part Number** – FPGA-VDES4-ILT

**Who Should Attend?** – Engineers who seek advanced training in using Xilinx tools to improve FPGA performance and utilization while also increasing productivity

#### Prerequisites

- [Designing FPGAs Using the Vivado Design Suite 2](#) course
- [Designing FPGAs Using the Vivado Design Suite 3](#) course
- At least six months of design experience with Xilinx tools and FPGAs

#### Software Tools

- Vivado Design or System Edition 2017.3

#### Hardware

- Architecture: UltraScale™ and 7 series FPGAs\*
- Demo board: Kintex®-7 FPGA KC705 board

\* This course focuses on the UltraScale and 7 series architectures.

\*\* 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:

- Apply appropriate I/O timing constraints and design modifications for source-synchronous and system-synchronous interfaces
- Analyze a timing report to identify how to center the clock in the data eye
- Utilize floorplanning techniques to improve design performance
- Employ advanced implementation options, such as incremental compile flow, physical optimization techniques, and re-entrant mode as last mile strategies
- Utilize Xilinx security features, bitstream encryption, and authentication using AES for design and IP security
- Identify advanced FPGA configurations, such as daisy chains and gangs, for configuring multiple FPGAs in a design
- Debug a design at the device startup phase to debug issues related to startup events, such as MMCM lock and design coming out of reset
- Use Tcl scripting in non-project batch flows to synthesize, implement, and generate custom timing reports

### Course Outline

#### Day 1

- UltraFast Design Methodology: Design Closure {Lecture}
- Scripting in Vivado Design Suite Non-Project Mode {Lecture, Lab}
- Hierarchical Design {Lecture}
- Managing Remote IP {Lecture, Lab}
- I/O Timing Scenarios {Lecture}
- System-Synchronous I/O Timing {Lecture, Demo}
- Source-Synchronous I/O Timing {Lecture, Lab}
- Timing Constraints Priority {Lecture}
- Case Analysis {Lecture}
- Introduction to Floorplanning {Lecture}
- Design Analysis and Floorplanning {Lecture, Lab}
- Congestion {Lecture}

- Introduction to the Xilinx Tcl Store {Lecture, Demo}
- Incremental Compile Flow {Lecture, Lab}

#### Day 2

- Physical Optimization {Lecture, Lab}
- Vivado Design Suite ECO Flow {Lecture, Lab}
- Power Management Techniques {Lecture}
- Daisy Chains and Gangs in Configuration {Lecture}
- Bitstream Security {Lecture, Demo}
- Vivado Design Suite Debug Methodology {Lecture}
- Trigger and Debug at Device Startup {Lecture, Demo}
- Trigger Using the Trigger State Machine in the Vivado Logic Analyzer {Lecture, Lab}
- Debugging the Design Using Tcl Commands {Lecture, Lab}
- Using Procedures in Tcl Scripting {Lecture}
- Using Lists in Tcl Scripting {Lecture}
- Using regexp in Tcl Scripting {Lecture, Lab}
- Debugging and Error Handling in Tcl Scripts {Lecture}

### Topic Descriptions

#### Day 1

- UltraFast Design Methodology: Design Closure – Introduces the UltraFast™ design methodology guidelines covered in this course.
- Scripting in Vivado Design Suite Non-Project Mode – Write Tcl commands in the non-project batch flow for a design.
- Hierarchical Design – Overview of the hierarchical design flows in the Vivado Design Suite.
- Managing Remote IP – Store IP and related files remote to the current working project directory.
- I/O Timing Scenarios – Overview of various I/O timing scenarios, such as source- and system-synchronous, direct/MMCM capture, and edge/center aligned data.
- System-Synchronous I/O Timing – Apply I/O delay constraints and perform static timing analysis for a system-synchronous input interface.
- Source-Synchronous I/O Timing – Apply I/O delay constraints and perform static timing analysis for a source-synchronous, double data rate (DDR) interface.
- Timing Constraints Priority – Identify the priority of timing constraints.
- Case Analysis – Understand how to analyze timing when using multiplexed clocks in a design.
- Introduction to Floorplanning – Introduction to floorplanning and how to use Pblocks while floorplanning.
- Design Analysis and Floorplanning – Explore the pre- and post-implementation design analysis features of the Vivado IDE.
- Congestion - Identifies congestion and addresses congestion issues.
- Introduction to the Xilinx Tcl Store – Introduces the Xilinx Tcl Store.
- Incremental Compile Flow – Utilize the incremental compile flow when making last-minute RTL changes.

#### Day 2

- Physical Optimization – Use physical optimization techniques for timing closure.
- Vivado Design Suite ECO Flow – Use the ECO flow to make changes to a previously implemented design and apply changes to the original design.
- Power Management Techniques – Identify techniques used for low power design.
- Daisy Chains and Gangs in Configuration – Introduces advanced configuration schemes for multiple FPGAs.

- Bitstream Security – Understand the Xilinx bitstream security features such as readback disable, bitstream encryption, and authentication.
- Vivado Design Suite Debug Methodology – Understand and follow the debug core recommendations. Employ the debug methodology for debugging a design using the Vivado logic analyzer.
- Trigger and Debug at Device Startup – Debug the events around the device startup.
- Trigger Using the Trigger State Machine in the Vivado Logic Analyzer – Use trigger state machine code to trigger the ILA and capture data in the Vivado logic analyzer.
- Debugging the Design Using Tcl Commands – Use Tcl scripting for VLA designs for adding probes and making connections to probes.
- Using Procedures in Tcl Scripting - Employ procedures in Tcl scripting.
- Using Lists in Tcl Scripting – Employ lists in Tcl scripting.
- Using regexp in Tcl Scripting – Use regular expressions to find a pattern in a text file while scripting an action in the Vivado Design Suite.
- Debugging and Error Handling in Tcl Scripts – Understand how to debug errors in a Tcl script.

## Register Today

Morgan Advanced Programmable Systems, Inc. (MAPS, Inc.) 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](http://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

- Students 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](#).

## MAPS Inc. 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.
- MAPS 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 MAPS 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](#).