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Accelerating Vitis HLS Development with the AMD Ross Agentic AI Assistant

ROSS-HLS-AI (v1.0)

Course Specification

Course Description

This course introduces the AMD Ross™ agentic AI assistant for Vitis™ high-level synthesis (HLS) and demonstrates how AI-assisted workflows can improve productivity throughout the HLS development process. Participants examine common challenges in traditional HLS development, explore the concepts of model context protocol (MCP), grounded knowledge, and agent skills, and learn how the Ross assistant supports architecture generation, optimization, and workflow execution. Through a series of hands-on labs, attendees gain practical experience using these AI-assisted workflows to accelerate development while maintaining engineering review and validation.

The emphasis of this course is on:

- Understanding common challenges in traditional HLS development
- Exploring the concepts of MCP, grounded knowledge, and agent skills
- Using the Ross agentic AI assistant for architecture generation, optimization, and workflow execution
- Gaining hands-on experience with Ross-assisted HLS workflows across three labs
- Maintaining engineering review and validation within the Ross-assisted flow

License requirement: To complete the hands-on labs, participants must have their own access to a supported AI provider (for example, an Anthropic or OpenAI account or API key) for use with the Claude Code CLI and Vitis Theia AI. Refer to the Lab Setup Guide for setup and licensing details.

Note: AI-assisted workflows are model-dependent. Some models may require multiple iterations and prompt refinements before reaching the desired outcome. Models with larger context windows and stronger reasoning capabilities generally achieve the expected results more consistently and with fewer interactions.

Level – DSP 3

Course Details

- 1 day ILT or 2 sessions 20261

Course Part Number – ROSS-HLS-AI

Who Should Attend? – Engineers and developers working with Vitis HLS who want to accelerate design and optimization using AI-assisted workflows.

Prerequisites

- Basic familiarity with C/C++
- Basic knowledge of HLS concepts (DATAFLOW, initiation interval, pipelining)
- Familiarity with the Vitis Unified IDE is helpful

Software Tools

- Vitis Unified IDE
- Vivado™ Design
- Claude Code CLI (reference AI client)
- OpenCV 4.x (required for Labs 2 and 3)
- MATLAB® 2025b or later (required for Lab3)

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

- Describe the AMD Ross agentic AI assistant and how AI-assisted workflows accelerate HLS development
- Explain the concepts of MCP, grounded knowledge, and agent skills
- Use the assistant to restructure a baseline design into a pipelined dataflow (HLS) architecture
- Use the assistant to iteratively optimize an HLS design toward performance and resource targets
- Run the same AI-assisted workflow in both the Claude Code CLI and the Vitis Unified IDE (Theia AI)
- Apply engineering review and validation to AI-generated results

Course Outline

Day 1

- **Introduction to AMD Ross Agentic AI Assistant for Vitis High-Level Synthesis (HLS)**
  Introduces the Ross agentic AI assistant, the challenges of traditional HLS development, and the concepts of MCP, grounded knowledge, and agent skills that enable AI-assisted architecture generation, optimization, and workflow execution. {Lecture}
- **Vitis HLS AI Assistant: Matrix Multiplication**
  Use Ross to redesign and optimize a matrix multiplication (MatMul) kernel, reaching more than 8x throughput improvement over the baseline. {Lab}
- **Vitis HLS AI Assistant: Global Tone Mapping**
  Use Ross to optimize a global tone mapping (GTM) kernel, reducing true-latency by more than 2x within a 1.5x resource budget. {Lab}
- **Vitis HLS AI Assistant: Edge Detection (MATLAB-to-HLS)**
  Use Ross to convert a MATLAB Sobel edge detector to HLS and optimize it to reach 4,400 FPS at 303 MHz. {Lab}

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