Task 8: RTL Optimization & Debugging – Fix, Shrink, and Analyze

You're working with the RTL optimization team at Prism Studio, reviewing resource-heavy designs before they're deployed on limited FPGA hardware. Your job is to identify inefficient Verilog code, reduce logic utilization, and fix timing and behavioral bugs introduced during synthesis.

Objective:

To analyze, debug, and optimize Verilog code for logic usage, timing violations, and synthesis mismatches. You'll refactor RTL for efficiency and validate performance using Vivado resource reports and simulation.

What You Have to Do

- Analyze inefficient or broken RTL designs
- Optimize logic, reduce LUT/FF count, and resolve bugs
- Simulate both original and optimized versions
- Document improvements with comparison reports

How to Approach

1. Simulate the original RTL and identify issues
2. Analyze Vivado Utilization Report (LUTs, FFs, Delay)
3. Rewrite logic using better FSM or operator control
4. Validate correctness with waveform comparisons
5. Document before/after improvement clearly

Task Outcome

You'll develop the ability to debug complex RTL, identify synthesis problems, and optimize designs under real resource and timing constraints — a critical skill for any RTL or FPGA design engineer.

What to Submit

- Original and optimized Verilog code
- Simulation results (before vs after)
- Vivado synthesis reports (.util & .timing)
- GitHub repo with commit logs

Deadline

- Flexible Submission Policy: While there is no fixed deadline for task submissions, interns are expected to complete and submit all assigned work within a reasonable timeframe.

Task Submission Guidelines

Self-Resolve Errors:

Resolve all errors on your own. Doing this helps you build problem-solving skills and ensures you won't run into the same issues during future tasks.

Use All Available Resources:

You're allowed to explore, Google, or check out tutorials in order to understand concepts and successfully complete the task.

No Purchases:

Don't buy any paid software or tools instead look for free options instead. Just understand how they work.

Once you've completed the task, upload your work to GitHub and submit the repository link using the form below.

Submit Task

WISHING YOU SUCCESS

Contact us: team@prismstudio.co.in
(For questions, support, or clarifications)