

Chapter 2 - OpenROAD workflow

Course authors (Git file)



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Section 1

History of OpenROAD



Foundations and Realization of Open, Accessible Design (OpenROAD)

At the top of the documentation:

<https://openroad-flow-scripts.readthedocs.io>



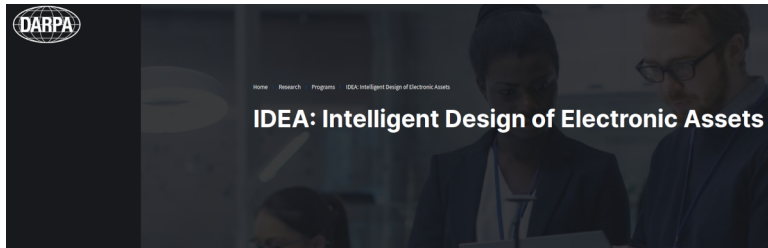
Figure 1: Darpa IDEA ¹

¹Source: Screenshot of the webpage.



Darpa IDEA

<https://www.darpa.mil/research/programs/intelligent-design-of-electronic-assets>



Program Summary

Next-generation intelligent systems supporting Department of Defense (DoD) applications like artificial intelligence, autonomous vehicles, shared spectrum communication, electronic warfare, and radar require processing efficiency that is orders of magnitude beyond what is available through current commercial electronics. Reaching the performance levels required by these DoD

Figure 2: Darpa IDEA ²

²Source: Screenshot of the webpage.



Darpa ERI

2018/2019 Darpa ERI, cadence and the people

<https://community.cadence.com/tags/openroad>

Start reading from the bottom!

ERI: OpenROAD



Paul McLellan

If I had to summarize DARPA's Electronic Resurgence Initiative in one phrase, it would be "getting the cost of design down." As I've said several times this week, the US Department of Defense (DoD) does not have high volumes and so the cost of a part...

over 6 years ago

[Cadence Blogs](#)

[Breakfast Bytes](#)

The DARPA Electronic Resurgence Initiative (ERI)



Paul McLellan

Many weeks ago DARPA organized a summit at the Palace of Fine Arts in San Francisco. The first day consisted of a workshop and some other presentations, including one by Cadence's Tom Beckley. Since Tom's presentation was very similar to what he presented...

over 6 years ago

[Cadence Blogs](#)

[Breakfast Bytes](#)

Figure 3: Darpa ERI ³



OpenROAD V1.0

Document with OpenROAD V1.0 Expectations:

<https://vlsicad.ucsd.edu/NEWS19/OpenROAD%20RTL-to-GDS%20v1.0%20Expectations.pdf>

OpenROAD v1.0 Expectations

Andrew B. Kahng and Tom Spyrou
The OpenROAD Project

November 22, 2019

Web: <https://theopenroadproject.org/>
GitHub: <https://github.com/The-OpenROAD-Project>

The OpenROAD v1.0 tool, to be released in July 2020, will be capable of push-button, DRC-clean RTL-to-GDS layout generation in a commercial FinFET process node. The tool is currently visible [here](#). In its v1.0 form, it will be integrated on an incremental substrate provided by [the OpenDB database](#) and [the OpenSTA static timing engine](#). It will also offer users and

Figure 4: OpenROAD v1.0 ⁴



V1.0 Roadmap

How to deal with these expectations:

<https://eri-summit.darpa.mil/docs/ERISummit2019/posh/08IDEA%20UCSD%20Website.pdf>

Looking Forward (Year 2 = Phase 1B)

- **V1.0 July 2020 must advance 20 years on EDA industry learning curve within next 2-3 quarters**
 - 1980's file-based integration **July 2019**
 - 2000's tight integration on shared incremental substrate **July 2020**
- **Next: architecture, database, build/CI/devops, CAE/PE,**
 - + **teaching EDA SW to the OpenROAD/FOSS community**
- **Professionals on the team: mandatory**
 - **Industry veterans who have "done this before"**

Figure 5: Looking forward ⁵

⁵Source: Screenshot of the webpage.



Courses for OpenROAD

A single excellent project (some of us might know):

<https://theopenroadproject.org/Courses/>



The screenshot shows the OpenROAD website's 'Courses' page. It features a dark blue header with the 'OpenROAD' logo and a navigation menu. Below the header, the word 'Courses' is displayed. A table lists available courses, with one entry visible: 'ZeroToASIC by Matt Venn' with a corresponding file link.

Title	File/Link
ZeroToASIC by Matt Venn	https://zerotoasiccourse.com/matt_venn/

Figure 6: Courses⁶

⁶Source: Screenshot of the webpage.



Help is on the way

Kudos to this course:

<https://theopenroadproject.org/news/6455/>



Figure 7: This course ⁷

⁷Source: Screenshot of the webpage.



Section 2

OpenROAD Flow Scripts



Flow steps



Figure 8: OpenROAD flow steps ⁸



Flow components

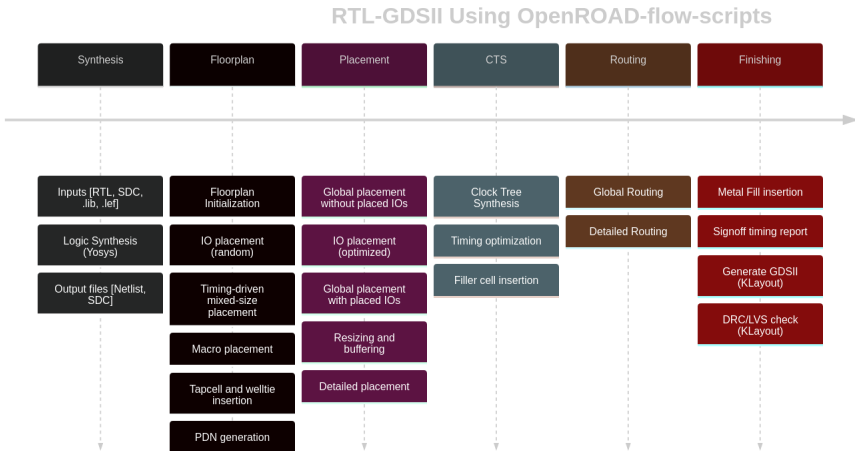


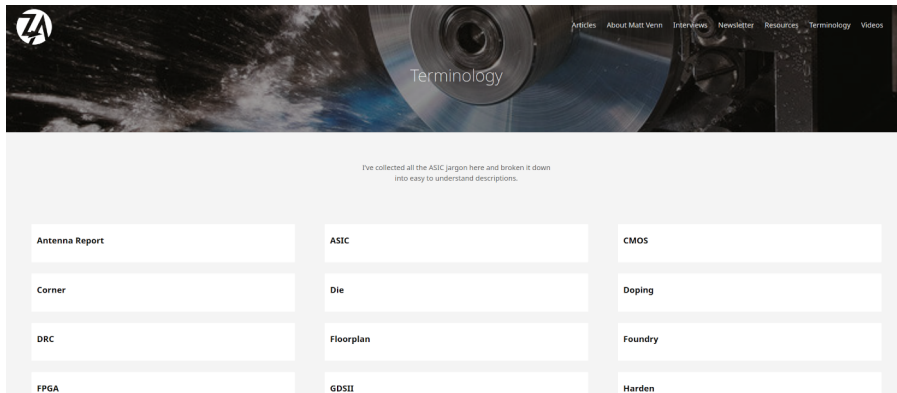
Figure 9: OpenROAD flow components⁹



Help with the terminology

Searching the terms with a standard search engine might not bring usefull results every time. Matt Venn created a page for EDA terminology:

<https://www.zerotoasiccourse.com/terminology/>



Resources list

Awesome open-source asic resources:

<https://github.com/mattvenn/awesome-opensource-asic-resources>

Zero-to-ASIC resources list:

<https://www.zerotoasiccourse.com/resources/>

AIC 2025 lectures by Carsten Wulff:

<https://github.com/wulffern/aic2025>

<https://analogicus.com/aic2025/>



The list of open-source tools

The list of flow steps and flow components in ORFS contains the information about the original open-source tools.

We will dive a little deeper into this list with the course training:

<https://openroad-flow-scripts.readthedocs.io/en/latest/tutorials/FlowTutorial.html#running-the-automated-rtl-to-gds-flow>

