

This Document is prepared by *Team VLSI_FRONT_END*

The Intention of this document is to bring all the VLSI frontend related links at a single place.

Linkedin Page : <https://www.linkedin.com/company/vlsifrontend>

1. Common Websites

1. <https://verificationguide.com/>
2. <http://www.testbench.in/>
3. <https://www.chipverify.com/>
4. <http://www.asic-world.com/>
5. <https://verificationacademy.com/>
6. [Synopsys UVM](#)
7. [Easier UVM](#)
8. [Digital Electronics](#)

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2. DIGITAL DESIGN

1. [Digital Electronics by Neso Academy](#)
2. [Digital Design Morris Mano](#)
3. [Digital Design by NPTEL.](#)
4. [Digital Design Widmer Tocci](#)
5. <http://www.fullchipdesign.com/>
6. [Digital Design Course](#)
7. [Electronics Hub](#)
8. [Priority Encoder](#)

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3. VHDL

1. [VHDL Basics](#)
2. [VHDL Merged](#)
3. [VHDL Package and Other Constructs](#)
4. [VHDL by Intel](#)
5. [VHDL Mini Reference](#)
6. [Intel FPGA Official Youtube Link](#)
7. [HDL Works](#)
8. [ASIC World Website](#)
9. [VHDL Tutorial](#)
10. [FPGA Design using VHDL Lectures](#)
11. [VHDL Attributes](#)
12. [Golden Reference Guide](#)
13. [VHDL Primer](#)
14. [Tutorials Point VHDL](#)

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4. Verilog

1. [Digital System Design with VHDL](#)
2. [Chip Verify](#)
3. [Verilog Quick Reference](#)
4. [Verilog By Intel](#)
5. [Full Adder](#)
6. [Verilog Examples](#)
7. [Verification Guide](#)
8. [Intel FPGA Official Youtube Link](#)
9. [RTL Design](#)
10. [Verilog by NPTEL](#)
11. [Golden Reference Guide Verilog](#)
12. [Golden Reference Guide SV](#)
13. [Verilog](#)
14. [HDL Works](#)
15. [Verilog code for FIFO memory](#)
16. [Testbench in](#)
17. [Verilog Tips and Tricks/File Reading](#)
18. [Asic World](#)
19. [RF Wireless World](#)
20. [Full Chip Design](#)
21. [Fpga4fun](#)
22. [Only Vlsi](#)
23. [Verilog](#)
24. [Intro to Verilog](#)
25. [FSM by Berkeley EDU](#)
26. [System Verilog For Design Quick Reference](#)

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5. System Verilog

1. [Verification Guide SV](#)
2. [System Verilog basic PPT](#)
3. [SV by Cadence](#)
4. [SV Interfaces](#)
5. [Operators](#)
6. [Operators](#)
7. [Verification Excellence SV and UVM](#)
8. [Testbench in](#)
9. [System Verilog for Verification](#)
10. [Static Variables and functions](#)
11. [Static and Automatic Lifetime of Variable and Methods](#)
12. [DVCON 2020](#)
13. [Verification academy Events](#)
14. [casting string to enum](#)
15. [casting string to enum](#)
16. [The Art Of Verification](#)
17. [VLSI Verify](#)
18. [always block in task](#)
19. [Amiq Consulting](#)

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6.Fork- Join Questions

1. <https://verificationacademy.com/forums/systemverilog/fork-within-loop-join-all>
2. <https://verificationacademy.com/forums/systemverilog/loop-inside-fork-joinnone>
3. <https://verificationacademy.com/forums/systemverilog/fork-joinnone-inside-loop#reply-38644>
4. <https://verificationacademy.com/forums/systemverilog/controlling-fork-joinnone-threads-execution>
5. <https://verificationacademy.com/forums/systemverilog/controlling-fork-joinnone-threads-execution>
6. <https://verificationacademy.com/forums/systemverilog/automatic-variables-fork>
7. <https://testbench4u.com/2018/10/01/fork-join-tricky-example/>
8. <https://dvtalk.me/2020/12/06/about-systemverilog-process-and-fork/>
9. <https://blog.verificationgentleman.com/2014/03/10/a-subtle-gotcha-when-using-forkjoin.html>

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7. Universal Verification Methodology (UVM)

1. [UVM Class Reference](#)
2. [UVM by Synopsys](#)
3. [Easier UVM By John Aynsley](#)
4. [Verification Guide UVM](#)
5. [Chip verify UVM](#)
6. [Mentor Graphics Verification Academy UVM](#)
7. [UVM Configuration Data Base DVCON](#)
8. [Golden Reference Guide UVM](#)
9. [Learn UVM Verification](#)
10. [UVM TEST NAME](#)
11. [UVM command line processor](#)
12. [Mentor UVM Cook Book](#)
13. [UVM Doulos](#)
14. [Test bench UVM](#)
15. [UVM for Beginners](#)
16. [UVM Primer](#)
17. [Verilab UVM](#)
18. [UVM TLM Interfaces](#)
19. [uvm re match](#)
20. [UVM Coding](#)
21. [UVM Commandline Argument](#)
22. [UVM Verbosity](#)
23. <http://cluelogic.com/category/uvm/>
24. <https://blog.verifcationgentleman.com/years/>
25. [UVM Event](#)
26. https://www.amiq.com/consulting/2014/08/08/how-to-stop-the-simulation-on-uvm_error/ -
- UVM ERROR
27. <https://www.vlsiguru.com/uvm-notes2020/> -- UVM Notes VLSIGURU
28. [UVM Tips & Tricks](#)
29. <https://vlsiverify.com/>
30. <https://www.amiq.com/consulting/resources/>

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31. [uvm_re_match](#)

32. [Verilab UVM](#)

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8.PROTOCOLS ::(AXI/SPI/I2C/UART/AXI4/AXI STREAM etc...)

SPI Protocol:

1. <https://electrosome.com/spi/>
2. http://pythonway-pw.blogspot.com/2017/05/spi-working-with-verilog-code_99.html
3. <https://learn.sparkfun.com/tutorials/serial-peripheral-interface-spi/all>
4. <https://www.youtube.com/watch?v=AuhFr88mjt0>

APB Protocol:

1. <https://youtu.be/BfBnIZuQHTs>
2. <https://youtu.be/ZQa8DIJfa2s>

AXI Protocol:

1. AXI Part 1 : <https://youtu.be/i1vzrANrsOc>
2. AXI Part 2 : https://youtu.be/cZvO_vGNQq8
3. AXI Part 3 : <https://youtu.be/LkeR5UG10tc>
4. http://www.gstitt.ece.ufl.edu/courses/fall15/eel4720_5721/labs/refs/AXI4_specific_ation.pdf -- AXI Spec
5. https://www.xilinx.com/support/documentation/ip_documentation/axi_interconnect/v2_1/pg059-axi-interconnect.pdf -- AXI Interconnect
6. https://www.xilinx.com/support/documentation/ip_documentation/axi_ref_guide/latest/ug761_axi_reference_guide.pdf --AXI

AHB Protocol:

1. AHB Part 1 : <https://youtu.be/bEF8eXZZt7k>
2. AHB Part 2 : <https://youtu.be/Pkv4tVlsfiA>
3. AHB Part 3 : <https://youtu.be/jpugXK8srgs>

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Other Links:

1. <http://pythonway-pw.blogspot.com/2018/02/i2c-verilog-code-and-working.html> -- I2C
2. <http://infocenter.arm.com/help/index.jsp> --Arm Official Website
3. <https://www.ti.com/lit/ds/symlink/tlk100.pdf?ts=1590932876482> -- Ethernet PHY
4. <http://infocenter.arm.com/help/index.jsp?topic=/com.arm.doc.set.amba/index.html> --Arm Official Website
5. <http://verificationexcellence.in/soc-bus-protocols/> -- Bus Protocols.
6. <https://courses.cs.washington.edu/courses/cse466/12au/calendar/07-Communication-posted.pdf> – Basics Of Communication.
7. https://www.doulos.com/knowhow/verilog_designers_guide/models/universal_asynchronous_receiver_uar/
8. http://www.cpri.info/downloads/CPRI_v_7_0_2015-10-09.pdf -- CPRI
9. http://www.cpri.info/downloads/eCPRI_v_1_1_2018_01_10.pdf -- eCPRI
10. ETHERNET PHY <https://youtu.be/JH3cMYErmKI>
11. <https://blogs.synopsys.com/vip-central/2019/11/21/demystifying-pcie-pipe-5-1-serdes-architecture/> -- PCIE Serdes.

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9. Coverage

- <https://www.amiq.com/consulting/2015/09/18/functional-coverage-patterns-bitwise-coverage/>
- https://www.amiq.com/consulting/2015/09/18/functional-coverage-patterns-bitwise-coverage/#bit_masking_coverage
- <https://www.amiq.com/consulting/blog/page/3/?tag=functional-coverage>
- <https://www.amiq.com/consulting/2018/01/15/how-to-alternative-ways-to-implement-bitwise-coverage/>
- <https://www.amiq.com/consulting/2014/09/17/how-to-ignore-cross-coverage-bins-using-expressions-in-systemverilog/>
- <https://verificationguide.com/systemverilog/systemverilog-functional-coverage/>
- http://www.testbench.in/CO_00_INDEX.html
- <https://verificationacademy.com/forums/coverage/coverage-any-one-bits-register>

Parameterized Interfaces and Reusable VIP

- <https://blogs.synopsys.com/vip-central/2015/01/27/parameterized-interfaces-and-reusable-vip-part-1/>
- <https://blogs.synopsys.com/vip-central/2015/02/19/parameterized-interfaces-and-reusable-vip-part-2/>
- <https://blogs.synopsys.com/vip-central/2015/02/24/parameterized-interfaces-and-reusable-vip-part-3/>

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10. SCRIPTING

::(Perl/Shell/Python/Makefile/Bash/Awk, Tcl)

UNIX/LINUX:

<https://ivlsi.com/basic-linux-commands-vlsi/>

PERL:

1. <https://www.youtube.com/user/madhurbhatia89/playlists>

SHELL:

2. <https://www.youtube.com/user/madhurbhatia89/playlists>
3. https://www.youtube.com/playlist?list=PLS1QuIWo1RIYmaxcEqw5JhK3b-6rgdWO_
4. https://www.youtube.com/playlist?list=PL2qzCKTbjutJRM7K_hhNyvf8sfGCLkIXw
5. <https://www.youtube.com/playlist?list=PL8cE5Nxf6M6b8qW7CSMsdkBkEsPdG9pWfu>
6. https://gutl.jovenclub.cu/wp-content/uploads/2013/10/Linux.Shell_.Scripting.Cookbook.pdf

PYTHON:

1. <https://www.w3schools.com/python/default.asp>
2. <https://www.tutorialspoint.com/python/>
3. <https://realpython.com/python-first-steps/>
4. <https://www.javatpoint.com/python-tutorial>
5. <https://www.youtube.com/user/madhurbhatia89/playlists>

TCL:

1. <https://wiki.tcl-lang.org/page/Tcl+Tutorial+Lesson+0>
2. https://www.intel.com/content/dam/www/programmable/us/en/pdfs/literature/manual/tcls_criptrefmnl.pdf
3. https://www.youtube.com/playlist?list=PL1h5a0eaDD3rsGDFnVki_fFEtDWQfXjca

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Makefile:

1. https://www.youtube.com/playlist?list=PLbMVogVj5nJRa3VKt_eyZdJ_DitCz1cvQ -- Linux,tcl,perl,Makefile by nptel.
2. <https://www.tldp.org/LDP/Bash-Beginners-Guide/Bash-Beginners-Guide.pdf> -- Bash Guide for Beginners.
3. https://www.gnu.org/software/make/manual/html_node/#toc-Overview-of-make --GNU Makefile.
4. https://www.gnu.org/software/make/manual/html_node/Introduction.html#Introduction -- GNU Makefile.https://www.gnu.org/software/make/manual/html_node/Rule-Introduction.html#Rule-Introduction --GNU Makefile.
5. https://www.gnu.org/software/make/manual/html_node/Phony-Targets.html#Phony-Targets --GNU Makefile.
6. https://www.gnu.org/software/make/manual/html_node/Conditional-Example.html --GNU Makefile.
7. https://www.gnu.org/software/make/manual/html_node/Conditional-Example.html --GNU Makefile.
8. <http://www.asic-world.com/>
9. <http://www.asicguru.com/>

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11. TIMING ANALYSIS, STA & CDC

1. <https://www.eng.biu.ac.il/temanad/digital-vlsi-design/> --Timing Analysis
2. <http://www.eng.biu.ac.il/temanad/files/2017/02/Lecture-3-STA.pdf> --Timing Analysis.
3. <https://youtube.com/playlist?list=PLpCkjM331Aa8JNoZ1s1o1txve2wlf9pCP> -- Static Timing Analysis ,Yash Jain
4. <https://www.youtube.com/watch?v=RTcZOI2e8PI&feature=youtu.be> – CDC Intel
5. <https://www.youtube.com/watch?v=HMAqjCuDEI> – Setup and Hold Slack, Intel
6. <https://www.youtube.com/watch?v=6D-w8mOttNE&feature=youtu.be> – Timing Analysis , Intel
7. <https://vlsiuniverse.blogspot.com/2016/12/setup-hold-interview-questions.html>
8. <http://www.vlsi-expert.com/> -- VLSI Expert, STA.
9. <https://www.eetimes.com/understanding-clock-domain-crossing-issues/#> --CDC Explained.
10. <https://www.edn.com/basics-of-multi-cycle-false-paths/> -- Multicycle and false paths EDN.
11. <https://www.edn.com/synchronizer-techniques-for-multi-clock-domain-socs-fpgas/> -- Synchronization Techniques.
12. http://www.ee.bgu.ac.il/~digivlsi/slides/STA_9_1.pdf --STA
13. http://www.ee.bgu.ac.il/~digivlsi/slides/synopsys_class_3_6_1.pdf --STA
14. <https://www.ijitee.org/wp-content/uploads/papers/v8i7s/G10240587S19.pdf> --STA International Journal.
15. <https://classes.engineering.wustl.edu/ese461/> -- Timing Analysis, Design Automation for Integrated Circuit systems.
16. <https://www.youtube.com/c/TeamVLSI/videos>
17. <https://www.youtube.com/watch?v=UGGkKZyIJB0> – Timing closure, Intel
18. <https://www.youtube.com/c/TechnicalBytes/playlists>
19. http://www.sunburst-design.com/papers/CummingsSNUG2008Boston_CDC.pdf
20. <https://classes.engineering.wustl.edu/ese461/Lecture/week7b.pdf> -- Timing Analysis
21. Link(Verilog, VHDL, Timing, Quartus Prime Software, Qsys Editor, Platform Designer etc).
22. <https://www.intel.com/content/dam/www/programmable/us/en/pdfs/literature/an/an584.pdf> -- Timing Closure Methodology for Advanced FPGA Designs

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23. <https://vlsiuniverse.blogspot.com/search/label/How%20to%20avoid%20setup%20and%20hold%20time%20violations> -STA & Timing
24. <https://www.allaboutcircuits.com/technical-articles/why-how-pipelining-in-fpga/> --What is pipelining.
25. <https://www.youtube.com/watch?v=A3gLtieLLvc>
26. <https://youtu.be/2V41i4xVTZ8> -- Setup , hold , propagation delay , timing errors , Metastability.
27. http://www.sunburst-design.com/papers/CummingsSNUG2002SJ_Resets.pdf -- Sunburst Reset Strategy.
28. <https://www.youtube.com/watch?v=0Ho4rDswOeE&list=PL0pU5hg9yniZ2ka-XBXROXNR0pAEAEFCB> --Intel FPGA Official Youtube

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12. CODING GUIDELINES AND STYLES

1. <https://hackaday.io/project/20751-memory-on-cyclone5-fpga/details> -- Memory Coding Style.
2. <https://inst.eecs.berkeley.edu/~cs150/sp12/resources/FSM.pdf> --FSM Code style.
3. https://www.xilinx.com/support/documentation/white_papers/wp231.pdf – HDL coding Practises by XILINX.

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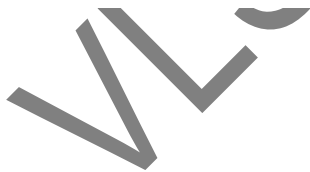
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13. Inferring a Latch

1. <https://stackoverflow.com/questions/22459413/what-is-inferred-latch-and-how-it-is-created-when-it-is-missing-else-statement-i>
2. <https://stackoverflow.com/questions/20036401/if-statements-causing-latch-inference-in-verilog>
3. <https://www.nandland.com/articles/how-to-avoid-transparent-latches-in-vhdl-and-verlog.html>
4. http://web.engr.oregonstate.edu/~traylor/ece474/vhdl_lectures/inferring_storage_elements.pdf
5. <http://www.doe.carleton.ca/~shams/ELEC3500/Ver2Syn.pdf>
6. [https://www.edaboard.com/showthread.php?313149-inferring-latch\(es\)-for-signal-VHDL-error](https://www.edaboard.com/showthread.php?313149-inferring-latch(es)-for-signal-VHDL-error)
7. <https://www.allaboutcircuits.com/technical-articles/vhdl-incomplete-if-statements-and-latch-inference/>
8. <https://www.doulos.com/knowhow/fpga/latches/>
9. <https://www.allaboutcircuits.com/technical-articles/use-of-clock-gating-to-reduce-power-consumption/> -- Clock Gating.
10. <https://www.cypress.com/documentation/component-datasheets/edge-detector> -- Edge Detector Circuit.
11. <https://groups.google.com/forum/#!topic/embeddednewbies/c6bMIbDUnt8> --Sunburst Papers.
12. <https://vdocuments.mx/search?q=Synthesizable+SystemVerilog%3A+Busting+the+Myth+that+...+%3F%3FSNUG+Silicon+Valley+2013+3+Synthesizing+SystemVerilog+1.0+Introduction+%E2%80%94+debunking+the+Verilog+vs.+SystemVerilog+myth+There+is+a+common+misconception+that+...&u=1> -- Sunburst Papers.



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14. Aynchronous FIFO's Explained

1. <https://hardwaregeeksblog.files.wordpress.com/2016/12/fifodepthcalculationmadeeasy2.pdf> -- FIFO Depth Calculation
2. <https://zipcpu.com/blog/2018/07/06/afifo.html>
3. <https://zipcpu.com/blog/2017/10/20/cdc.html>
4. <https://esrd2014.blogspot.com/p/first-in-first-out-buffer.html>
5. <http://electrosofts.com/verilog/fifo.html>
6. http://www.sunburst-design.com/papers/CummingsSNUG2002SJ_FIFO1.pdf -- Sunburst Asynchronous FIFO.
7. <https://github.com/JonathanJing/Asynchronous-FIFO>
8. <https://www.youtube.com/watch?v=Nr8q5VW-mXI> -- FIFO in FPGA.

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15. Interviews & Job Prep

1. Verilog Frequently Asked Questions.
https://www.google.com/url?sa=t&source=web&rct=j&url=https://lucc.pl/inf/architektura_komputerow_2/verilog/verilog_faq.pdf&ved=2ahUKEwio-4mn7truAhURX30KHWNhA-EQFjADegQIARAB&usg=AOvVaw3P28hknlasn1cuzeZESTL5
2. <https://www.theartofverification.com/>
3. <https://www.wisdomjobs.com/e-university/universal-verification-methodology-uvmm-interview-questions.html> --UVM Interview Questions.
4. http://www.asic.co.in/vlsi_presentations.htm
5. <https://vlsiuniverse.blogspot.com/2016/12/setup-hold-interview-questions.html>
6. <https://www.bestsampleresume.com/job-descriptions/engineer/fpga-design-engineer.html>
7. <http://only-vlsi.blogspot.com/2009/01/digital-design-interview-questions.html>
8. <https://www.wisdomjobs.com/e-university/verilog-interview-questions.html>

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16. FPGA

1. <https://www.intel.com/content/www/us/en/programmable/documentation/jbr1444752564689.html#esc1445881961208> --Intel Hyperflex Architecture.
2. <https://numato.com/kb-category/getting-started-with-fpga/>
3. https://www.intel.com/content/dam/www/programmable/us/en/pdfs/literature/hb/stratix-10/s10_hp_hb.pdf -- Intel Stratix 10 user guide
4. https://www.xilinx.com/support/documentation/sw_manuals/xilinx11/ise_c_implement_fpga_design.htm -- XILINX FPGA's
5. https://www.youtube.com/watch?v=bwoyQ_RnaiA – FPGA Design by Intel.
6. <https://www.embedded.com/model-based-fpga-design-tool-quietly-gains-adherents/>
7. <https://www.mentor.com/products/fv/multimedia/player/coverage-plan-driven-verification-for-fpgas-4d3ebed0-d534-47f4-ae75-ee290f676593> -- Coverage & Plan-Driven Verification for FPGAs

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17. FPGA Constraints

1. <https://www.edn.com/fpga-constraints-for-the-modern-world-product-how-to/> -- FPGA constraints.

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18. Tools

1. <https://www.edaplayground.com/> -- EDA Play Ground
2. <https://www.youtube.com/watch?v=A1qhavaVlnw> How to use www.edaplayground.com EDA by VLSI Guru
3. [VIVADO TCL](#)
4. [Quartus Prime Tool Tutorial, Clock Fabric Youtube Channel](#)
5. [Questasim](#)
6. [Quartus Prime Timing Analyzer](#)

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19. Editors

1. https://www.youtube.com/watch?v=NPtLV_hqoml&list=PLY7ywYIJrK2IH0p-P42g-ku5B0mns_R&index=1 -- GVIM Usage
2. <https://www.youtube.com/watch?v=jXud3JybsG4> -- GVIM
3. <http://www.verifcationguide.com/p/gvim-or-vim-commands-set.html> --- GVIM commands
4. <https://www.cs.cmu.edu/~15131/f17/topics/vim/vim-cheatsheet.pdf> -- GVIM cheat sheet
5. <https://vim.rtorr.com/>
6. <https://devhints.io/vim>
7. http://www.atmos.albany.edu/daes/atmclasses/atm350/vi_cheat_sheet.pdf
8. <https://rumorscity.com/2014/08/16/5-best-vim-cheat-sheet/>
9. <https://www.cs.oberlin.edu/~kuperman/help/vim/windows.html>
10. <https://www.ele.uri.edu/faculty/vetter/Other-stuff/vi/vimtips.html>
11. https://vim.fandom.com/wiki/Moving_lines_up_or_down
12. <https://learninggentleman.com/programming/in-these-series-i-share-some-of-my-favorite-vim-editor-tips/>

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20. Cron Job

- <https://sagar5258.blogspot.com/2015/04/crontab-in-linux-cron-jobscheduled-task.html>

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21. Other

1. <http://www.sunburst-design.com/> --Sunburst Design Official Website.
2. https://www.verilogpro.com/systemverilog-always_comb-always_ff/-- Verilog pro Website
3. <https://hdvacademy.blogspot.com/p/index.html?view=classic> -- Hardware Design and Verification Academy.
4. <https://www.embedded.com/model-based-fpga-design-tool-quietly-gains-adherents/>
5. <http://verificationexcellence.in/> -- Verification Excellence Official Website.
6. <https://www.chipverify.com/> -- Chip Verify Official Website.
7. <http://blog.imm.cnr.it/content/linux-check-disk-space-command-view-system-disk-usage-df-and-du> -- Disk Space Usage.

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22. GIT

1. <https://dont-be-afraid-to-commit.readthedocs.io/en/latest/git/index.html>

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23. NPTEL Useful Courses

1. <https://nptel.ac.in/courses/117/105/117105080/>
2. <https://nptel.ac.in/courses/106/105/106105185/>
3. <https://nptel.ac.in/courses/106/105/106105165/>
4. <https://nptel.ac.in/courses/106/103/106103016/>
5. <https://nptel.ac.in/courses/106/103/106103116/>
6. <https://nptel.ac.in/courses/117/108/117108040/>
7. <https://nptel.ac.in/courses/117/106/117106092/>
8. <https://nptel.ac.in/courses/117/106/117106086/>
9. <https://nptel.ac.in/courses/108/106/108106137/>

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24. 5G

1. https://www.keysight.com/upload/cmc_upload/All/Understanding_the_5G_NR_Physical_Layer.pdf -- Understanding 5G Layers.
2. <https://www.youtube.com/watch?v=RagHojSWEz8&list=PLfUa5X9whIE9UI3j1PcZ5FUKFsVixjXP&index=1> --5G

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