



IEEE DASC P1076.1 Working Group

<http://www.eda-twiki.org/vhdl-ams/>

Working Group Meeting November 9, 2016

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Agenda

- ◆ Call to order
- ◆ Approval of agenda
- ◆ Administrative issues
 - Minutes of October 12, 2016 meeting
 - IEEE patent policy
 - Elections
- ◆ Project discussions
 - LCSs: 201x-21, 201x-22
 - Other projects
 - LRM review status
- ◆ Next meeting
- ◆ AOB
- ◆ Adjourn



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Administrative Issues

- ◆ Approval of WG meeting minutes
 - [Meeting of October 12, 2016](#)
 - Available at <http://www.eda-twiki.org/vhdl-ams>
- ◆ Review of IEEE patent policy
 - <http://standards.ieee.org/board/pat/pat-slideset.pdf>
- ◆ Elections
 - Joachim's term as Secretary expires at end of 2016
 - Plan
 - Call for nominations: This week
 - Voting: Starting week of November 28
- ◆ Handling of copyrighted material
 - Copyright Permission
 - Letters received: Cadence, Eastman Kodak, Accellera
 - Working on it: Synopsys
 - Including WG in LRM review



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Project Discussion: LCS 201x-21 Transfer Fcts 1

- ◆ Q'LTF and Q'ZTF have the same use model
 - Transfer function is specified by coefficients of numerator and denominator polynomials
- ◆ Numerical issues with Q'LTF:
 - For high frequency applications and high order transfer functions, coefficients of Q'LTF scratch the limits of the range representable with double precision numbers. Example:
 - The minimum range of the coefficients of the denominator polynomial of a 10th order bandpass filter at 1 GHz is 1.0 to $\approx (2^{\pi} \cdot 1e9)^{10}$, i.e. 1.0 to $\approx 1e100$
 - If Q'LTF is implemented as specified in the LRM, this large span of numbers appears in the Jacobian matrix
 - ⇒ There is a potential for numerical problems (large/small numbers)
 - Polynomial roots are inaccurate ⇒ potential for distortion of transfer function
- ◆ No such problems exist for Q'ZTF
 - The magnitude of the z-domain roots is close to but smaller than 1



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Project Discussion: LCS 201x-21 Transfer Fcts 2

- ◆ Numerical problems disappear if roots are specified instead of polynomial coefficients
 - Tools can implement transfer function as a sequence of 2nd order sections
 - 4 forms are possible: Num/Den, Zeros/Den, Num/Poles, Zeros/Poles
 - Zeros/Den and Num/Poles have no benefits
 - ⇒ Focus on Zeros/Poles form
 - Zeros and poles are in general complex
- ◆ Issues
 - Type COMPLEX is defined in package IEEE.MATH_COMPLEX
 - Not visible at the point of defining the predefined attribute
 - There is no type COMPLEX_VECTOR

Project Discussion: LCS 201x-21 Transfer Fcts 3

- ◆ Making a COMPLEX type available
 - Declare type COMPLEX in package STD.STANDARD
 - Issues when leaving the declaration in IEEE.MATH_COMPLEX:
 - The two declarations declare two distinct types
 - Without a use clause that makes IEEE.MATH_COMPLEX.COMPLEX visible, the declaration in package STD.STANDARD is directly visible, i.e. constant c: complex := (1.0, 2.0); is legal
 - With a use clause that makes IEEE.MATH_COMPLEX.COMPLEX visible, neither declaration is directly visible
 - Issues when removing the declaration in IEEE.MATH_COMPLEX:
 - Backward compatibility issues: The expanded name ieee.math_complex.complex is no longer valid
 - Alternative
 - Modify implicit context items to include library IEEE
 - library STD, WORK, IEEE; use STD.STANDARD.all;
 - Merely declares the library name, with no impact on visibility
 - Refer to type COMPLEX by an expanded name where necessary

Project Discussion: LCS 201x-21 Transfer Fcts 4

- ◆ Type COMPLEX_VECTOR
 - Declaration can be added to the package in which type COMPLEX is declared
 - Issue: The VHDL-AMS version of package would differ from the VHDL version
- ◆ Definitional form: For Laplace transfer function:

$$H(s) = K_1 \frac{\prod_{i=1}^M (1 - \frac{s}{z_i})}{\prod_{i=1}^N (1 - \frac{s}{p_i})} \quad H(s) = K_2 \frac{\prod_{i=1}^M (s - z_i)}{\prod_{i=1}^N (s - p_i)}$$
 - Verilog-AMS uses the left, Matlab/Simulink the right form
- ◆ LCS 201x-21 includes
 - A discussion of the issues and possible solutions
 - The LRM changes to support the zero/pole forms for Laplace and z-domain transfer functions
 - A recommendation to reject this enhancement due to the definitional complexities regarding the types

Mandatory Changes: LRM Clauses

Clause	Title	LCS	Review status
1	Overview of this Standard	201x-22	Reviewed
2	Normative references	201x-22	Reviewed
3	Design entities and configurations	201x-03, 201x-12	Reviewed
4	Subprograms and packages	201x-12	Reviewed
5	Types and natures	201x-04	Reviewed
6	Declarations	201x-11	Reviewed
7	Specifications	201x-07	Reviewed
8	Names	201x-01	Reviewed
9	Expressions	201x-05	Reviewed
10	Sequential statements	201x-06	Reviewed
11	Architecture statements	201x-03	Reviewed
12	Scope and visibility	201x-08	
13	Design units and their analysis	201x-09	
14	Elaboration and execution	201x-14, 201x-02	
15	Lexical elements	201x-10	
16	Predefined language environment	201x-13, 201x-17	
17-23	VHPI	201x-16	
24	Standard tool directives	201x-15	

Mandatory Changes: Annexes

Annex	Title	Status
A	Informative Description of accompanying files	201x-17 covers 1076.1.1
B	Normative VHPI header file	Related to 201x-16
C	Informative Syntax summary	Done as part of LRM editing
D	Informative Potentially nonportable constructs	
E	Informative Changes from IEEE Std 1076.1-2007	To be done late
F	Informative Changes from IEEE Std 1076-2002	Merge with Annex E
G	Informative Features under consideration for removal	No candidates
H	Informative Guide to use of standard packages	201x-17 covers 1076.1.1
I	Informative Guide to use of protect directives	201x-15
J	Informative Glossary	Needs review
K	Informative Bibliography	Needs review
L	Informative Index	Done as part of LRM editing



Status of LCSs

LCS	Title	LRM Clauses	Status	Review status
201x-01	External names	8.7	Approved	
201x-02	Simulation cycle	14.7.5	Approved	
201x-03	Architecture statements	3.3.3, 11, 14.5.3	Approved	
201x-04	Types and natures	5	Approved	
201x-05	Expressions	9	Approved	
201x-06	Sequential statements	10	Approved	
201x-07	Specifications	7	Approved	
201x-08	Scope and visibility	12	Approved	
201x-09	Design units and their analysis	13	Approved	
201x-10	Lexical elements	15	Approved	
201x-11	Declarations	6, 11.13, 16.2.6	Approved	
201x-12	Design units	3, 4	Approved	
201x-13	Predefined language environment	16	Approved	
201x-14	Elaboration and execution	14	Approved	
201x-15	Standard tool directives	24	Approved	
201x-16	VHPI	17-23	Approved	
201x-17	Integration of IEEE Std 1076.1.1	Annex A, Annex G	Approved	
201x-18	Resolution of IRs	5, 6, 7	Approved	
201x-19	Frequency Domain Modeling	14	Approved	
201x-20	Working with Quantities at an ASP	14, 16	Approved	
201x-21	Alternate forms for transfer functions	16	Submitted	
201x-22	Clauses 1 and 2	1, 2	Submitted	



Project Discussion: Other Projects

Project	Status
Errata (IRs)	IRs 07.01...07.03: LCS 201x-18 Unfiled IR on Q'SLEW: Analyzed, incomplete
IEEE Std 1076.1.1 integration	LCS 201x-17
Table-driven modeling	Open Source
Vector/Matrix operations	Proposed Open Source
Frequency-domain modeling	LCS 201x-19
Minor enhancements	LCS 201x-20 Working with Quantities at an ASP LCS 201x-21 Alternate forms for 'LTF'/ZTF



Review and Approval of LCSs

- ◆ **New LCSs**
 - 201x-21 Alternate Forms of Laplace and Z-Domain Transfer Functions
 - 201x-22 Clauses 1 and 2



P1076.1-201x Draft LRM Status: Per LCS (1)

LCS Nr.	Title	WG status	Clauses	Status
201x-01	External names	Approved	8.7	Integrated.
201x-02	Simulation cycle	Approved	14.7.5	Integrated.
201x-03	Architecture statements	Approved	3.3.3	Integrated.
			11	Integrated.
			14.5.3	Integrated.
			Glossary	Integrated.
201x-04	Types and natures	Approved	5	Integrated.
201x-05	Expressions	Approved	9	Integrated.
201x-06	Sequential statements	Approved	10	Integrated.
201x-07	Specifications	Approved	7	Integrated.
201x-08	Scope and visibility	Approved	12	Integrated.
201x-09	Design units and their analysis	Approved	13	Integrated.
201x-10	Lexical elements	Approved	15	Integrated.
201x-11	Declarations	Approved	4.2.1	Integrated.
			6	Integrated.
			11.13	Integrated.
			16.2.6	Integrated.



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P1076.1-201x Draft LRM Status: Per LCS (2)

LCS Nr.	Title	WG status	Clauses	Status
201x-12	Design units	Approved	3	Integrated.
			4	Integrated.
201x-13	Predefined language environment	Approved	6	Integrated.
			16	Integrated.
201x-14	Elaboration and execution	Approved	14	Integrated.
201x-15	Standard tool directives	Approved	24	Integrated.
			Annex H	Integrated.
201x-16	VHPI	Approved	19	Integrated.
201x-17	Integration of IEEE Std 1076.1.1	Approved	16	Integrated.
			Annex A	Integrated.
			Annex G	Integrated.
			Annex J	Integrated.
201x-18	Resolution of IRs	Approved	5	Integrated.
			6	Integrated.
			7	Integrated.
201x-19	Frequency Domain Modeling	Approved	14	Integrated.
			16	Integrated.
201x-20	Quantities at ASP	Approved	14	Integrated.
			16	Integrated.
201x-21	Alternate Forms of Lapl. and Z-Dom. Transfer Functions	Revised	16	
201x-22	Clauses 1 and 2	Submitted	1	Integrated.
			2	Integrated.



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P1076.1-201x Draft LRM Status: Per Clause

LRM clause	Version	Notes
1. Overview	D0.1(1)	LCS 201x-22 integrated.
2. Normative references	D0.1(1)	LCS 201x-22 integrated.
3. Design entities and configurations	D0.1(1)	LCS 201x-03/12 integrated.
4. Subprograms and packages	D0.1(2)	LCS 201x-11/12 integrated.
5. Types and natures	D0.1(3)	LCS 201x-04/18 integrated.
6. Declarations	D0.1(3)	LCS 201x-11/13/18 integrated.
7. Specifications	D0.1(2)	LCS 201x-07/18 integrated.
8. Names	D0.1(1)	LCS 201x-01 integrated.
9. Expressions	D0.1(1)	LCS 201x-05 integrated.
10. Sequential statements	D0.1(1)	LCS 201x-06 integrated.
11. Architecture statements	D0.1(3)	LCS 201x-03/11 integrated.
12. Scope and visibility	D0.1(1)	LCS 201x-08 integrated.
13. Design units and their analysis	D0.1(1)	LCS 201x-09 integrated.
14. Elaboration and execution	D0.1(4)	LCS 201x-02/03/14/19/20 integrated.
15. Lexical elements	D0.1(1)	LCS 201x-10 integrated.
16. Predefined language environment	D0.1(6)	LCS 201x-11/13/17/19/20 integrated.
17-23. VHPI		
19. VHPI information model	D0.1(1)	LCS 201x-16 integrated.
24. Standard tool directives	D0.1(1)	LCS 201x-15 integrated.



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P1076.1-201x Draft LRM Status: Per Annex

LRM annex	Version	Notes
A. Description of accompanying files	D0.1(1)	LCS 201x-17 integrated.
B. VHPI header file		
C. Syntax summary	D0.1(1)	LCS 201x-01/03/04/11 integrated.
D. Potentially nonportable constructs		
E. Changes from IEEE Std 1076.1, 2007 Edition	D0.1(1)	First release, without any changes mentioned yet.
F. Features under consideration for removal		
G. Guide to use of standard packages	D0.1(1)	LCS 201x-17 integrated.
H. Guide to use of protect directives	D0.1(1)	LCS 201x-15 integrated.
I. Glossary	D0.1(2)	LCS 201x-03 integrated.
J. Bibliography	D0.1(1)	LCS 201x-17 integrated.



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Project Planning – Reminder

- ◆ **Completion of projects:** ~~2016~~ ~~Q3~~ ~~Q4~~ **2016 !**
 - Based on current data
- ◆ **Completion of LRM and other documents:** ~~2016~~ ~~Q3~~ ~~Q4~~ **2016**
- ◆ **First ballot:** ~~2016~~ ~~Q3~~ ~~Q4~~ **2017**
- ◆ **Second ballot:** **Q2 2017**
- ◆ **RevCom:** **Q3 2017**
- ◆ **Expiration of extended PAR:** **Dec. 31, 2017**



Next Steps

- ◆ **Technical and administrative work**
 - Complete handling of copyrighted material
 - Work with IEEE to get web site for packages
 - Complete review of LRM chapters
 - Include WG in LRM review
 - Elections for WG Secretary
- ◆ **Next meetings (announced at www.eda-twiki.org/vhdl-ams/):**
 - Wednesday, December 7, 2016, 08:00 am PST (16:00 UCT)

