

Contents

	Preface	ix
1	Enhanced Generics	1
	1.1 Generic Types	1
	1.2 Generic Lists in Packages	6
	1.3 Local Packages	11
	1.4 Generic Lists in Subprograms	15
	1.5 Generic Subprograms	21
	1.5.1 Uninstantiated Methods in Protected Types	32
	1.6 Generic Packages	36
	1.7 Use Case: Generic Memories	43
2	Other Major Features	53
	2.1 External Names	53
	2.2 Force and Release	63
	2.3 Context Declarations	67
	2.4 Integrated PSL	70
	2.5 IP Encryption	77
	2.5.1 Key Exchange	96
	2.6 VHDL Procedural Interface (VHPI)	97
	2.6.1 Direct Binding	97
	2.6.2 Tabular Registration and Indirect Binding	99
	2.6.3 Registration of Applications and Libraries	101
3	Type System Changes	103
	3.1 Unconstrained Element Types	103
	3.1.1 Composite Types	103
	3.1.2 Subtype Indications and Constraints	107
	3.1.3 Use of Composite Subtypes	109
	Variable and Signal Declarations	110
	Constant Declarations	110
	Attribute Specifications	111
	Allocated Objects	111
	Interface Objects	112
	Summary: Determining Array Index Ranges	117
	Type Conversions	118
	Alias Declarations and Subtype Attributes	119
	Resolved Composite Subtypes	122
	3.2 Resolved Elements	123

4	New and Changed Operations	127
4.1	Array/Scalar Logical Operations	127
4.2	Array/Scalar Addition Operators	129
4.3	Logical Reduction Operators	130
4.4	Condition Operator	132
4.5	Matching Relational Operators	133
4.6	Maximum and Minimum	138
4.7	Mod and Rem for Physical Types	140
4.8	Shift Operations	141
4.9	Strength Reduction and 'X' Detection	142
5	New and Changed Statements	143
5.1	Conditional and Selected Assignments	143
5.1.1	Sequential Signal Assignments	143
5.1.2	Forcing Assignments	146
5.1.3	Variable Assignments	147
5.2	Matching Case Statements	149
5.2.1	Matching Selected Assignments	150
5.3	If and Case Generate	151
5.3.1	Configuration of If and Case Generate	155
6	Modeling Enhancements	159
6.1	Signal Expressions in Port Maps	159
6.2	All Signals in Sensitivity List	161
6.3	Reading Out-Mode Ports and Parameters	162
6.4	Slices in Aggregates	166
6.5	Bit-String Literals	167
7	Improved I/O	169
7.1	The To_string Functions	169
7.1.1	Predefined To_string Functions	170
7.1.2	Overloaded To_string Functions	171
7.1.3	The To_ostring and To_hstring Functions	172
7.2	The Justify Function	173
7.3	Newline Formatting	173
7.4	Read and Write Operations	174
7.5	The Tee Procedure	177
7.6	The Flush Procedure	178
8	Standard Packages	179
8.1	The Std_logic_1164 Package	179
8.2	The Numeric_bit and Numeric_std Packages	180
8.3	The Numeric Unsigned Packages	182
8.4	The Fixed-Point Math Packages	182
8.5	The Floating-Point Math Packages	186

8.6	The Standard Package	191
8.7	The Env Package	192
8.8	Operator Overloading Summary	193
8.9	Conversion Function Summary	196
8.10	Strength Reduction Function Summary	204
9	Miscellaneous Changes	207
9.1	Referencing Generics in Generic Lists	207
9.2	Function Return Subtype	208
9.3	Qualified Expression Subtype	209
9.4	Type Conversions	209
9.5	Case Expression Subtype	211
9.6	Subtypes for Port and Parameter Actuals	212
9.7	Static Composite Expressions	213
9.8	Static Ranges	214
9.9	Use Clauses, Types, and Operations	215
9.10	Hiding of Implicit Operations	216
9.11	Multidimensional Array Alias	217
9.12	Others in Aggregates	217
9.13	Attribute Specifications in Package Bodies	219
9.14	Attribute Specification for Overloaded Subprograms	219
9.15	Integer Expressions in Range Bounds	220
9.16	Action on Assertion Violations	221
9.17	' Path_Name ' and ' Instance_Name '	221
9.18	Non-Nesting of Architecture Region	223
9.19	Purity of Now	223
9.20	Delimited Comments	224
9.21	Tool Directives	225
9.22	New Reserved Words	225
9.23	Replacement Characters	226
10	What's Next	229
10.1	Object-Oriented Class Types	229
10.1.1	Standard Components Library	232
10.2	Randomization	232
10.3	Functional Coverage	235
10.4	Alternatives	235
10.5	Getting Involved	235
	Index	237