

Tang

0.1

Generated by Doxygen 1.9.1

1 Tang: A Template Language	1
1.1 Quick Description	1
1.2 Features	1
1.3 License	1
2 Hierarchical Index	3
2.1 Class Hierarchy	3
3 Class Index	5
3.1 Class List	5
4 File Index	9
4.1 File List	9
5 Class Documentation	15
5.1 Tang::AstNode Class Reference	15
5.1.1 Detailed Description	18
5.1.2 Member Enumeration Documentation	18
5.1.2.1 PreprocessState	18
5.1.3 Constructor & Destructor Documentation	18
5.1.3.1 AstNode()	18
5.1.4 Member Function Documentation	19
5.1.4.1 compile()	19
5.1.4.2 compilePreprocess()	19
5.1.4.3 dump()	20
5.2 Tang::AstNodeArray Class Reference	21
5.2.1 Detailed Description	23
5.2.2 Member Enumeration Documentation	23
5.2.2.1 PreprocessState	23
5.2.3 Constructor & Destructor Documentation	23
5.2.3.1 AstNodeArray()	23
5.2.4 Member Function Documentation	24
5.2.4.1 compile()	24
5.2.4.2 compilePreprocess()	24
5.2.4.3 dump()	25
5.3 Tang::AstNodeAssign Class Reference	25
5.3.1 Detailed Description	27
5.3.2 Member Enumeration Documentation	27
5.3.2.1 PreprocessState	27
5.3.3 Constructor & Destructor Documentation	27
5.3.3.1 AstNodeAssign()	27
5.3.4 Member Function Documentation	28
5.3.4.1 compile()	28
5.3.4.2 compilePreprocess()	29

5.3.4.3 dump()	29
5.4 Tang::AstNodeBinary Class Reference	29
5.4.1 Detailed Description	32
5.4.2 Member Enumeration Documentation	32
5.4.2.1 Operation	32
5.4.2.2 PreprocessState	33
5.4.3 Constructor & Destructor Documentation	33
5.4.3.1 AstNodeBinary()	33
5.4.4 Member Function Documentation	33
5.4.4.1 compile()	33
5.4.4.2 compilePreprocess()	34
5.4.4.3 dump()	34
5.5 Tang::AstNodeBlock Class Reference	35
5.5.1 Detailed Description	37
5.5.2 Member Enumeration Documentation	37
5.5.2.1 PreprocessState	37
5.5.3 Constructor & Destructor Documentation	37
5.5.3.1 AstNodeBlock()	37
5.5.4 Member Function Documentation	38
5.5.4.1 compile()	38
5.5.4.2 compilePreprocess()	38
5.5.4.3 dump()	39
5.6 Tang::AstNodeBoolean Class Reference	39
5.6.1 Detailed Description	41
5.6.2 Member Enumeration Documentation	41
5.6.2.1 PreprocessState	41
5.6.3 Constructor & Destructor Documentation	41
5.6.3.1 AstNodeBoolean()	41
5.6.4 Member Function Documentation	42
5.6.4.1 compile()	42
5.6.4.2 compilePreprocess()	42
5.6.4.3 dump()	43
5.7 Tang::AstNodeBreak Class Reference	43
5.7.1 Detailed Description	45
5.7.2 Member Enumeration Documentation	45
5.7.2.1 PreprocessState	45
5.7.3 Constructor & Destructor Documentation	45
5.7.3.1 AstNodeBreak()	45
5.7.4 Member Function Documentation	45
5.7.4.1 compile()	46
5.7.4.2 compilePreprocess()	46
5.7.4.3 dump()	47

5.8 Tang::AstNodeCast Class Reference	47
5.8.1 Detailed Description	49
5.8.2 Member Enumeration Documentation	49
5.8.2.1 PreprocessState	49
5.8.2.2 Type	49
5.8.3 Constructor & Destructor Documentation	50
5.8.3.1 AstNodeCast()	50
5.8.4 Member Function Documentation	50
5.8.4.1 compile()	50
5.8.4.2 compilePreprocess()	51
5.8.4.3 dump()	51
5.9 Tang::AstNodeContinue Class Reference	51
5.9.1 Detailed Description	53
5.9.2 Member Enumeration Documentation	53
5.9.2.1 PreprocessState	53
5.9.3 Constructor & Destructor Documentation	53
5.9.3.1 AstNodeContinue()	54
5.9.4 Member Function Documentation	54
5.9.4.1 compile()	54
5.9.4.2 compilePreprocess()	55
5.9.4.3 dump()	55
5.10 Tang::AstNodeDoWhile Class Reference	55
5.10.1 Detailed Description	58
5.10.2 Member Enumeration Documentation	58
5.10.2.1 PreprocessState	58
5.10.3 Constructor & Destructor Documentation	58
5.10.3.1 AstNodeDoWhile()	58
5.10.4 Member Function Documentation	59
5.10.4.1 compile()	59
5.10.4.2 compilePreprocess()	59
5.10.4.3 dump()	60
5.11 Tang::AstNodeFloat Class Reference	60
5.11.1 Detailed Description	62
5.11.2 Member Enumeration Documentation	62
5.11.2.1 PreprocessState	62
5.11.3 Constructor & Destructor Documentation	62
5.11.3.1 AstNodeFloat()	62
5.11.4 Member Function Documentation	63
5.11.4.1 compile()	63
5.11.4.2 compilePreprocess()	63
5.11.4.3 dump()	64
5.12 Tang::AstNodeFor Class Reference	64

5.12.1 Detailed Description	66
5.12.2 Member Enumeration Documentation	66
5.12.2.1 PreprocessState	66
5.12.3 Constructor & Destructor Documentation	67
5.12.3.1 AstNodeFor()	67
5.12.4 Member Function Documentation	67
5.12.4.1 compile()	67
5.12.4.2 compilePreprocess()	68
5.12.4.3 dump()	68
5.13 Tang::AstNodeFunctionCall Class Reference	69
5.13.1 Detailed Description	70
5.13.2 Member Enumeration Documentation	70
5.13.2.1 PreprocessState	70
5.13.3 Constructor & Destructor Documentation	71
5.13.3.1 AstNodeFunctionCall()	71
5.13.4 Member Function Documentation	71
5.13.4.1 compile()	71
5.13.4.2 compilePreprocess()	72
5.13.4.3 dump()	72
5.14 Tang::AstNodeFunctionDeclaration Class Reference	72
5.14.1 Detailed Description	74
5.14.2 Member Enumeration Documentation	74
5.14.2.1 PreprocessState	74
5.14.3 Constructor & Destructor Documentation	74
5.14.3.1 AstNodeFunctionDeclaration()	74
5.14.4 Member Function Documentation	75
5.14.4.1 compile()	75
5.14.4.2 compilePreprocess()	75
5.14.4.3 dump()	76
5.15 Tang::AstNodelIdentifier Class Reference	76
5.15.1 Detailed Description	78
5.15.2 Member Enumeration Documentation	78
5.15.2.1 PreprocessState	78
5.15.3 Constructor & Destructor Documentation	79
5.15.3.1 AstNodelIdentifier()	79
5.15.4 Member Function Documentation	79
5.15.4.1 compile()	79
5.15.4.2 compilePreprocess()	80
5.15.4.3 dump()	81
5.16 Tang::AstNodelElse Class Reference	81
5.16.1 Detailed Description	83
5.16.2 Member Enumeration Documentation	83

5.16.2.1 PreprocessState	83
5.16.3 Constructor & Destructor Documentation	84
5.16.3.1 AstNodeIfElse() [1/2]	84
5.16.3.2 AstNodeIfElse() [2/2]	84
5.16.4 Member Function Documentation	84
5.16.4.1 compile()	84
5.16.4.2 compilePreprocess()	85
5.16.4.3 dump()	85
5.17 Tang::AstNodeIndex Class Reference	86
5.17.1 Detailed Description	88
5.17.2 Member Enumeration Documentation	88
5.17.2.1 PreprocessState	88
5.17.3 Constructor & Destructor Documentation	88
5.17.3.1 AstNodeIndex()	89
5.17.4 Member Function Documentation	89
5.17.4.1 compile()	89
5.17.4.2 compilePreprocess()	89
5.17.4.3 dump()	90
5.17.4.4 getCollection()	90
5.17.4.5 getIndex()	90
5.18 Tang::AstNodeInteger Class Reference	91
5.18.1 Detailed Description	93
5.18.2 Member Enumeration Documentation	93
5.18.2.1 PreprocessState	93
5.18.3 Constructor & Destructor Documentation	93
5.18.3.1 AstNodeInteger()	93
5.18.4 Member Function Documentation	94
5.18.4.1 compile()	94
5.18.4.2 compilePreprocess()	94
5.18.4.3 dump()	95
5.19 Tang::AstNodeLibrary Class Reference	95
5.19.1 Detailed Description	97
5.19.2 Member Enumeration Documentation	97
5.19.2.1 PreprocessState	97
5.19.3 Constructor & Destructor Documentation	97
5.19.3.1 AstNodeLibrary()	97
5.19.4 Member Function Documentation	98
5.19.4.1 compile()	98
5.19.4.2 compilePreprocess()	98
5.19.4.3 dump()	99
5.20 Tang::AstNodeMap Class Reference	99
5.20.1 Detailed Description	101

5.20.2 Member Enumeration Documentation	101
5.20.2.1 PreprocessState	101
5.20.3 Constructor & Destructor Documentation	101
5.20.3.1 AstNodeMap()	101
5.20.4 Member Function Documentation	101
5.20.4.1 compile()	102
5.20.4.2 compilePreprocess()	102
5.20.4.3 dump()	103
5.21 Tang::AstNodePeriod Class Reference	103
5.21.1 Detailed Description	105
5.21.2 Member Enumeration Documentation	105
5.21.2.1 PreprocessState	105
5.21.3 Constructor & Destructor Documentation	105
5.21.3.1 AstNodePeriod()	105
5.21.4 Member Function Documentation	106
5.21.4.1 compile()	106
5.21.4.2 compilePreprocess()	106
5.21.4.3 dump()	107
5.22 Tang::AstNodePrint Class Reference	107
5.22.1 Detailed Description	109
5.22.2 Member Enumeration Documentation	109
5.22.2.1 PreprocessState	109
5.22.2.2 Type	109
5.22.3 Constructor & Destructor Documentation	110
5.22.3.1 AstNodePrint()	110
5.22.4 Member Function Documentation	110
5.22.4.1 compile()	110
5.22.4.2 compilePreprocess()	110
5.22.4.3 dump()	111
5.23 Tang::AstNodeRangedFor Class Reference	111
5.23.1 Detailed Description	113
5.23.2 Member Enumeration Documentation	113
5.23.2.1 PreprocessState	113
5.23.3 Constructor & Destructor Documentation	113
5.23.3.1 AstNodeRangedFor()	113
5.23.4 Member Function Documentation	114
5.23.4.1 compile()	114
5.23.4.2 compilePreprocess()	114
5.23.4.3 dump()	115
5.24 Tang::AstNodeReturn Class Reference	116
5.24.1 Detailed Description	118
5.24.2 Member Enumeration Documentation	118

5.24.2.1 PreprocessState	118
5.24.3 Constructor & Destructor Documentation	118
5.24.3.1 AstNodeReturn()	118
5.24.4 Member Function Documentation	119
5.24.4.1 compile()	119
5.24.4.2 compilePreprocess()	119
5.24.4.3 dump()	120
5.25 Tang::AstNodeSlice Class Reference	120
5.25.1 Detailed Description	122
5.25.2 Member Enumeration Documentation	122
5.25.2.1 PreprocessState	122
5.25.3 Constructor & Destructor Documentation	123
5.25.3.1 AstNodeSlice()	123
5.25.4 Member Function Documentation	123
5.25.4.1 compile()	123
5.25.4.2 compilePreprocess()	124
5.25.4.3 dump()	124
5.26 Tang::AstNodeString Class Reference	125
5.26.1 Detailed Description	127
5.26.2 Member Enumeration Documentation	127
5.26.2.1 PreprocessState	127
5.26.3 Constructor & Destructor Documentation	127
5.26.3.1 AstNodeString() [1/2]	128
5.26.3.2 AstNodeString() [2/2]	128
5.26.4 Member Function Documentation	128
5.26.4.1 compile()	128
5.26.4.2 compileLiteral()	129
5.26.4.3 compilePreprocess()	129
5.26.4.4 dump()	130
5.26.4.5 getType()	130
5.26.4.6 getVal()	131
5.27 Tang::AstNodeTernary Class Reference	131
5.27.1 Detailed Description	133
5.27.2 Member Enumeration Documentation	133
5.27.2.1 PreprocessState	133
5.27.3 Constructor & Destructor Documentation	133
5.27.3.1 AstNodeTernary()	134
5.27.4 Member Function Documentation	134
5.27.4.1 compile()	134
5.27.4.2 compilePreprocess()	135
5.27.4.3 dump()	135
5.28 Tang::AstNodeUnary Class Reference	135

5.28.1 Detailed Description	137
5.28.2 Member Enumeration Documentation	137
5.28.2.1 Operator	137
5.28.2.2 PreprocessState	138
5.28.3 Constructor & Destructor Documentation	138
5.28.3.1 AstNodeUnary()	138
5.28.4 Member Function Documentation	138
5.28.4.1 compile()	138
5.28.4.2 compilePreprocess()	140
5.28.4.3 dump()	140
5.29 Tang::AstNodeUse Class Reference	141
5.29.1 Detailed Description	143
5.29.2 Member Enumeration Documentation	143
5.29.2.1 PreprocessState	143
5.29.3 Constructor & Destructor Documentation	143
5.29.3.1 AstNodeUse()	143
5.29.4 Member Function Documentation	144
5.29.4.1 compile()	144
5.29.4.2 compilePreprocess()	144
5.29.4.3 dump()	145
5.30 Tang::AstNodeWhile Class Reference	145
5.30.1 Detailed Description	148
5.30.2 Member Enumeration Documentation	148
5.30.2.1 PreprocessState	148
5.30.3 Constructor & Destructor Documentation	148
5.30.3.1 AstNodeWhile()	148
5.30.4 Member Function Documentation	149
5.30.4.1 compile()	149
5.30.4.2 compilePreprocess()	150
5.30.4.3 dump()	150
5.31 Tang::ComputedExpression Class Reference	150
5.31.1 Detailed Description	153
5.31.2 Member Function Documentation	153
5.31.2.1 __add()	153
5.31.2.2 __asCode()	153
5.31.2.3 __assign_index()	153
5.31.2.4 __boolean()	154
5.31.2.5 __divide()	154
5.31.2.6 __equal()	155
5.31.2.7 __float()	155
5.31.2.8 __getIterator()	155
5.31.2.9 __index()	156

5.31.2.10 __integer()	156
5.31.2.11 __iteratorNext()	156
5.31.2.12 __lessThan()	157
5.31.2.13 __modulo()	157
5.31.2.14 __multiply()	157
5.31.2.15 __negative()	158
5.31.2.16 __not()	158
5.31.2.17 __period()	158
5.31.2.18 __slice()	159
5.31.2.19 __string()	159
5.31.2.20 __subtract()	159
5.31.2.21 dump()	160
5.31.2.22 is_equal() [1/6]	160
5.31.2.23 is_equal() [2/6]	161
5.31.2.24 is_equal() [3/6]	161
5.31.2.25 is_equal() [4/6]	161
5.31.2.26 is_equal() [5/6]	162
5.31.2.27 is_equal() [6/6]	162
5.31.2.28 isCopyNeeded()	162
5.31.2.29 makeCopy()	163
5.32 Tang::ComputedExpressionArray Class Reference	163
5.32.1 Detailed Description	166
5.32.2 Constructor & Destructor Documentation	166
5.32.2.1 ComputedExpressionArray()	166
5.32.3 Member Function Documentation	166
5.32.3.1 __add()	166
5.32.3.2 __asCode()	167
5.32.3.3 __assign_index()	167
5.32.3.4 __boolean()	168
5.32.3.5 __divide()	168
5.32.3.6 __equal()	168
5.32.3.7 __float()	169
5.32.3.8 __getIterator()	169
5.32.3.9 __index()	169
5.32.3.10 __integer()	170
5.32.3.11 __iteratorNext()	170
5.32.3.12 __lessThan()	171
5.32.3.13 __modulo()	171
5.32.3.14 __multiply()	171
5.32.3.15 __negative()	172
5.32.3.16 __not()	172
5.32.3.17 __period()	172

5.32.3.18 __slice()	173
5.32.3.19 __string()	174
5.32.3.20 __subtract()	174
5.32.3.21 append()	174
5.32.3.22 dump()	175
5.32.3.23 getContents()	175
5.32.3.24 getMethods()	175
5.32.3.25 is_equal() [1/6]	176
5.32.3.26 is_equal() [2/6]	176
5.32.3.27 is_equal() [3/6]	176
5.32.3.28 is_equal() [4/6]	177
5.32.3.29 is_equal() [5/6]	177
5.32.3.30 is_equal() [6/6]	177
5.32.3.31 isCopyNeeded()	178
5.32.3.32 makeCopy()	178
5.33 Tang::ComputedExpressionBoolean Class Reference	179
5.33.1 Detailed Description	181
5.33.2 Constructor & Destructor Documentation	181
5.33.2.1 ComputedExpressionBoolean()	181
5.33.3 Member Function Documentation	181
5.33.3.1 __add()	181
5.33.3.2 __asCode()	182
5.33.3.3 __assign_index()	182
5.33.3.4 __boolean()	182
5.33.3.5 __divide()	182
5.33.3.6 __equal()	183
5.33.3.7 __float()	183
5.33.3.8 __getIterator()	184
5.33.3.9 __index()	184
5.33.3.10 __integer()	184
5.33.3.11 __iteratorNext()	184
5.33.3.12 __lessThan()	185
5.33.3.13 __modulo()	185
5.33.3.14 __multiply()	186
5.33.3.15 __negative()	186
5.33.3.16 __not()	186
5.33.3.17 __period()	186
5.33.3.18 __slice()	187
5.33.3.19 __string()	187
5.33.3.20 __subtract()	188
5.33.3.21 dump()	188
5.33.3.22 is_equal() [1/6]	188

5.33.3.23 <code>is_equal()</code> [2/6]	189
5.33.3.24 <code>is_equal()</code> [3/6]	189
5.33.3.25 <code>is_equal()</code> [4/6]	189
5.33.3.26 <code>is_equal()</code> [5/6]	190
5.33.3.27 <code>is_equal()</code> [6/6]	190
5.33.3.28 <code>isCopyNeeded()</code>	190
5.33.3.29 <code>makeCopy()</code>	191
5.34 <code>Tang::ComputedExpressionCompiledFunction</code> Class Reference	191
5.34.1 Detailed Description	193
5.34.2 Constructor & Destructor Documentation	193
5.34.2.1 <code>ComputedExpressionCompiledFunction()</code>	194
5.34.3 Member Function Documentation	194
5.34.3.1 <code>__add()</code>	194
5.34.3.2 <code>__asCode()</code>	194
5.34.3.3 <code>__assign_index()</code>	195
5.34.3.4 <code>__boolean()</code>	195
5.34.3.5 <code>__divide()</code>	195
5.34.3.6 <code>__equal()</code>	196
5.34.3.7 <code>__float()</code>	196
5.34.3.8 <code>__getIterator()</code>	197
5.34.3.9 <code>__index()</code>	197
5.34.3.10 <code>__integer()</code>	197
5.34.3.11 <code>__iteratorNext()</code>	197
5.34.3.12 <code>__lessThan()</code>	198
5.34.3.13 <code>__modulo()</code>	198
5.34.3.14 <code>__multiply()</code>	199
5.34.3.15 <code>__negative()</code>	199
5.34.3.16 <code>__not()</code>	199
5.34.3.17 <code>__period()</code>	199
5.34.3.18 <code>__slice()</code>	200
5.34.3.19 <code>__string()</code>	200
5.34.3.20 <code>__subtract()</code>	201
5.34.3.21 <code>dump()</code>	201
5.34.3.22 <code>is_equal()</code> [1/6]	201
5.34.3.23 <code>is_equal()</code> [2/6]	202
5.34.3.24 <code>is_equal()</code> [3/6]	202
5.34.3.25 <code>is_equal()</code> [4/6]	202
5.34.3.26 <code>is_equal()</code> [5/6]	203
5.34.3.27 <code>is_equal()</code> [6/6]	203
5.34.3.28 <code>isCopyNeeded()</code>	203
5.34.3.29 <code>makeCopy()</code>	204
5.35 <code>Tang::ComputedExpressionError</code> Class Reference	204

5.35.1 Detailed Description	207
5.35.2 Constructor & Destructor Documentation	207
5.35.2.1 ComputedExpressionError()	207
5.35.3 Member Function Documentation	207
5.35.3.1 __add()	207
5.35.3.2 __asCode()	208
5.35.3.3 __assign_index()	208
5.35.3.4 __boolean()	208
5.35.3.5 __divide()	208
5.35.3.6 __equal()	209
5.35.3.7 __float()	209
5.35.3.8 __getIterator()	209
5.35.3.9 __index()	210
5.35.3.10 __integer()	210
5.35.3.11 __iteratorNext()	210
5.35.3.12 __lessThan()	211
5.35.3.13 __modulo()	211
5.35.3.14 __multiply()	212
5.35.3.15 __negative()	212
5.35.3.16 __not()	212
5.35.3.17 __period()	212
5.35.3.18 __slice()	213
5.35.3.19 __string()	213
5.35.3.20 __subtract()	214
5.35.3.21 dump()	214
5.35.3.22 is_equal() [1/6]	214
5.35.3.23 is_equal() [2/6]	215
5.35.3.24 is_equal() [3/6]	215
5.35.3.25 is_equal() [4/6]	215
5.35.3.26 is_equal() [5/6]	216
5.35.3.27 is_equal() [6/6]	216
5.35.3.28 isCopyNeeded()	216
5.35.3.29 makeCopy()	217
5.36 Tang::ComputedExpressionFloat Class Reference	217
5.36.1 Detailed Description	219
5.36.2 Constructor & Destructor Documentation	219
5.36.2.1 ComputedExpressionFloat()	219
5.36.3 Member Function Documentation	220
5.36.3.1 __add()	220
5.36.3.2 __asCode()	220
5.36.3.3 __assign_index()	221
5.36.3.4 __boolean()	221

5.36.3.5 __divide()	221
5.36.3.6 __equal()	222
5.36.3.7 __float()	222
5.36.3.8 __getIterator()	223
5.36.3.9 __index()	223
5.36.3.10 __integer()	223
5.36.3.11 __iteratorNext()	224
5.36.3.12 __lessThan()	224
5.36.3.13 __modulo()	224
5.36.3.14 __multiply()	225
5.36.3.15 __negative()	225
5.36.3.16 __not()	226
5.36.3.17 __period()	226
5.36.3.18 __slice()	226
5.36.3.19 __string()	227
5.36.3.20 __subtract()	227
5.36.3.21 dump()	228
5.36.3.22 getValue()	228
5.36.3.23 is_equal() [1/6]	228
5.36.3.24 is_equal() [2/6]	229
5.36.3.25 is_equal() [3/6]	229
5.36.3.26 is_equal() [4/6]	229
5.36.3.27 is_equal() [5/6]	230
5.36.3.28 is_equal() [6/6]	230
5.36.3.29 isCopyNeeded()	231
5.36.3.30 makeCopy()	231
5.37 Tang::ComputedExpressionInteger Class Reference	231
5.37.1 Detailed Description	233
5.37.2 Constructor & Destructor Documentation	233
5.37.2.1 ComputedExpressionInteger()	233
5.37.3 Member Function Documentation	234
5.37.3.1 __add()	234
5.37.3.2 __asCode()	234
5.37.3.3 __assign_index()	235
5.37.3.4 __boolean()	235
5.37.3.5 __divide()	235
5.37.3.6 __equal()	236
5.37.3.7 __float()	236
5.37.3.8 __getIterator()	237
5.37.3.9 __index()	237
5.37.3.10 __integer()	237
5.37.3.11 __iteratorNext()	238

5.37.3.12 __lessThan()	238
5.37.3.13 __modulo()	238
5.37.3.14 __multiply()	239
5.37.3.15 __negative()	240
5.37.3.16 __not()	240
5.37.3.17 __period()	240
5.37.3.18 __slice()	241
5.37.3.19 __string()	241
5.37.3.20 __subtract()	241
5.37.3.21 dump()	242
5.37.3.22 getValue()	242
5.37.3.23 is_equal() [1/6]	242
5.37.3.24 is_equal() [2/6]	243
5.37.3.25 is_equal() [3/6]	243
5.37.3.26 is_equal() [4/6]	244
5.37.3.27 is_equal() [5/6]	244
5.37.3.28 is_equal() [6/6]	244
5.37.3.29 isCopyNeeded()	245
5.37.3.30 makeCopy()	245
5.38 Tang::ComputedExpressionIterator Class Reference	246
5.38.1 Detailed Description	248
5.38.2 Constructor & Destructor Documentation	248
5.38.2.1 ComputedExpressionIterator()	248
5.38.3 Member Function Documentation	248
5.38.3.1 __add()	248
5.38.3.2 __asCode()	249
5.38.3.3 __assign_index()	249
5.38.3.4 __boolean()	250
5.38.3.5 __divide()	250
5.38.3.6 __equal()	250
5.38.3.7 __float()	251
5.38.3.8 __getIterator()	251
5.38.3.9 __index()	251
5.38.3.10 __integer()	252
5.38.3.11 __iteratorNext()	252
5.38.3.12 __lessThan()	253
5.38.3.13 __modulo()	253
5.38.3.14 __multiply()	253
5.38.3.15 __negative()	254
5.38.3.16 __not()	254
5.38.3.17 __period()	254
5.38.3.18 __slice()	255

5.38.3.19 <code>__string()</code>	255
5.38.3.20 <code>__subtract()</code>	255
5.38.3.21 <code>dump()</code>	256
5.38.3.22 <code>is_equal()</code> [1/6]	256
5.38.3.23 <code>is_equal()</code> [2/6]	257
5.38.3.24 <code>is_equal()</code> [3/6]	258
5.38.3.25 <code>is_equal()</code> [4/6]	258
5.38.3.26 <code>is_equal()</code> [5/6]	259
5.38.3.27 <code>is_equal()</code> [6/6]	259
5.38.3.28 <code>isCopyNeeded()</code>	259
5.38.3.29 <code>makeCopy()</code>	260
5.39 <code>Tang::ComputedExpressionIteratorEnd</code> Class Reference	260
5.39.1 Detailed Description	262
5.39.2 Member Function Documentation	262
5.39.2.1 <code>__add()</code>	262
5.39.2.2 <code>__asCode()</code>	263
5.39.2.3 <code>__assign_index()</code>	263
5.39.2.4 <code>__boolean()</code>	264
5.39.2.5 <code>__divide()</code>	264
5.39.2.6 <code>__equal()</code>	264
5.39.2.7 <code>__float()</code>	265
5.39.2.8 <code>__getIterator()</code>	265
5.39.2.9 <code>__index()</code>	265
5.39.2.10 <code>__integer()</code>	266
5.39.2.11 <code>__iteratorNext()</code>	266
5.39.2.12 <code>__lessThan()</code>	266
5.39.2.13 <code>__modulo()</code>	267
5.39.2.14 <code>__multiply()</code>	267
5.39.2.15 <code>__negative()</code>	268
5.39.2.16 <code>__not()</code>	268
5.39.2.17 <code>__period()</code>	268
5.39.2.18 <code>__slice()</code>	269
5.39.2.19 <code>__string()</code>	269
5.39.2.20 <code>__subtract()</code>	269
5.39.2.21 <code>dump()</code>	270
5.39.2.22 <code>is_equal()</code> [1/6]	270
5.39.2.23 <code>is_equal()</code> [2/6]	271
5.39.2.24 <code>is_equal()</code> [3/6]	272
5.39.2.25 <code>is_equal()</code> [4/6]	272
5.39.2.26 <code>is_equal()</code> [5/6]	273
5.39.2.27 <code>is_equal()</code> [6/6]	273
5.39.2.28 <code>isCopyNeeded()</code>	273

5.39.2.29 makeCopy()	274
5.40 Tang::ComputedExpressionLibrary Class Reference	274
5.40.1 Detailed Description	276
5.40.2 Member Function Documentation	276
5.40.2.1 __add()	276
5.40.2.2 __asCode()	277
5.40.2.3 __assign_index()	277
5.40.2.4 __boolean()	278
5.40.2.5 __divide()	278
5.40.2.6 __equal()	278
5.40.2.7 __float()	279
5.40.2.8 __getIterator()	279
5.40.2.9 __index()	279
5.40.2.10 __integer()	280
5.40.2.11 __iteratorNext()	280
5.40.2.12 __lessThan()	280
5.40.2.13 __modulo()	281
5.40.2.14 __multiply()	281
5.40.2.15 __negative()	282
5.40.2.16 __not()	282
5.40.2.17 __period()	282
5.40.2.18 __slice()	283
5.40.2.19 __string()	283
5.40.2.20 __subtract()	283
5.40.2.21 dump()	284
5.40.2.22 is_equal() [1/6]	284
5.40.2.23 is_equal() [2/6]	285
5.40.2.24 is_equal() [3/6]	286
5.40.2.25 is_equal() [4/6]	286
5.40.2.26 is_equal() [5/6]	287
5.40.2.27 is_equal() [6/6]	287
5.40.2.28 isCopyNeeded()	287
5.40.2.29 makeCopy()	288
5.41 Tang::ComputedExpressionLibraryBase Class Reference	288
5.41.1 Member Function Documentation	290
5.41.1.1 __add()	290
5.41.1.2 __asCode()	291
5.41.1.3 __assign_index()	291
5.41.1.4 __boolean()	292
5.41.1.5 __divide()	292
5.41.1.6 __equal()	292
5.41.1.7 __float()	293

5.41.1.8 __getIterator()	293
5.41.1.9 __index()	293
5.41.1.10 __integer()	294
5.41.1.11 __iteratorNext()	294
5.41.1.12 __lessThan()	294
5.41.1.13 __modulo()	295
5.41.1.14 __multiply()	295
5.41.1.15 __negative()	296
5.41.1.16 __not()	296
5.41.1.17 __period()	296
5.41.1.18 __slice()	297
5.41.1.19 __string()	297
5.41.1.20 __subtract()	297
5.41.1.21 dump()	298
5.41.1.22 is_equal() [1/6]	298
5.41.1.23 is_equal() [2/6]	299
5.41.1.24 is_equal() [3/6]	300
5.41.1.25 is_equal() [4/6]	300
5.41.1.26 is_equal() [5/6]	301
5.41.1.27 is_equal() [6/6]	301
5.41.1.28 isCopyNeeded()	301
5.41.1.29 makeCopy()	302
5.42 Tang::ComputedExpressionMap Class Reference	302
5.42.1 Detailed Description	304
5.42.2 Constructor & Destructor Documentation	305
5.42.2.1 ComputedExpressionMap()	305
5.42.3 Member Function Documentation	305
5.42.3.1 __add()	305
5.42.3.2 __asCode()	305
5.42.3.3 __assign_index()	306
5.42.3.4 __boolean()	306
5.42.3.5 __divide()	306
5.42.3.6 __equal()	307
5.42.3.7 __float()	307
5.42.3.8 __getIterator()	307
5.42.3.9 __index()	308
5.42.3.10 __integer()	308
5.42.3.11 __iteratorNext()	309
5.42.3.12 __lessThan()	309
5.42.3.13 __modulo()	309
5.42.3.14 __multiply()	310
5.42.3.15 __negative()	310

5.42.3.16 __not()	310
5.42.3.17 __period()	310
5.42.3.18 __slice()	311
5.42.3.19 __string()	311
5.42.3.20 __subtract()	312
5.42.3.21 dump()	312
5.42.3.22 is_equal() [1/6]	313
5.42.3.23 is_equal() [2/6]	313
5.42.3.24 is_equal() [3/6]	313
5.42.3.25 is_equal() [4/6]	314
5.42.3.26 is_equal() [5/6]	314
5.42.3.27 is_equal() [6/6]	314
5.42.3.28 isCopyNeeded()	315
5.42.3.29 makeCopy()	315
5.43 Tang::ComputedExpressionNativeBoundFunction Class Reference	316
5.43.1 Detailed Description	318
5.43.2 Constructor & Destructor Documentation	318
5.43.2.1 ComputedExpressionNativeBoundFunction()	319
5.43.3 Member Function Documentation	319
5.43.3.1 __add()	319
5.43.3.2 __asCode()	320
5.43.3.3 __assign_index()	320
5.43.3.4 __boolean()	321
5.43.3.5 __divide()	321
5.43.3.6 __equal()	321
5.43.3.7 __float()	322
5.43.3.8 __getIterator()	322
5.43.3.9 __index()	322
5.43.3.10 __integer()	323
5.43.3.11 __iteratorNext()	323
5.43.3.12 __lessThan()	323
5.43.3.13 __modulo()	325
5.43.3.14 __multiply()	325
5.43.3.15 __negative()	326
5.43.3.16 __not()	326
5.43.3.17 __period()	326
5.43.3.18 __slice()	327
5.43.3.19 __string()	327
5.43.3.20 __subtract()	327
5.43.3.21 dump()	328
5.43.3.22 getArgc()	328
5.43.3.23 getFunction()	328

5.43.3.24 <code>getTargetTypeIndex()</code>	329
5.43.3.25 <code>is_equal()</code> [1/6]	329
5.43.3.26 <code>is_equal()</code> [2/6]	329
5.43.3.27 <code>is_equal()</code> [3/6]	330
5.43.3.28 <code>is_equal()</code> [4/6]	330
5.43.3.29 <code>is_equal()</code> [5/6]	330
5.43.3.30 <code>is_equal()</code> [6/6]	331
5.43.3.31 <code>isCopyNeeded()</code>	331
5.43.3.32 <code>makeCopy()</code>	331
5.44 <code>Tang::ComputedExpressionNativeFunction</code> Class Reference	332
5.44.1 Detailed Description	334
5.44.2 Constructor & Destructor Documentation	334
5.44.2.1 <code>ComputedExpressionNativeFunction()</code>	334
5.44.3 Member Function Documentation	334
5.44.3.1 <code>__add()</code>	335
5.44.3.2 <code>__asCode()</code>	335
5.44.3.3 <code>__assign_index()</code>	335
5.44.3.4 <code>__boolean()</code>	336
5.44.3.5 <code>__divide()</code>	336
5.44.3.6 <code>__equal()</code>	336
5.44.3.7 <code>__float()</code>	337
5.44.3.8 <code>__getIterator()</code>	337
5.44.3.9 <code>__index()</code>	338
5.44.3.10 <code>__integer()</code>	338
5.44.3.11 <code>__iteratorNext()</code>	338
5.44.3.12 <code>__lessThan()</code>	339
5.44.3.13 <code>__modulo()</code>	339
5.44.3.14 <code>__multiply()</code>	339
5.44.3.15 <code>__negative()</code>	340
5.44.3.16 <code>__not()</code>	340
5.44.3.17 <code>__period()</code>	340
5.44.3.18 <code>__slice()</code>	341
5.44.3.19 <code>__string()</code>	341
5.44.3.20 <code>__subtract()</code>	342
5.44.3.21 <code>dump()</code>	342
5.44.3.22 <code>getArgc()</code>	342
5.44.3.23 <code>getFunction()</code>	343
5.44.3.24 <code>is_equal()</code> [1/6]	343
5.44.3.25 <code>is_equal()</code> [2/6]	344
5.44.3.26 <code>is_equal()</code> [3/6]	344
5.44.3.27 <code>is_equal()</code> [4/6]	345
5.44.3.28 <code>is_equal()</code> [5/6]	345

5.44.3.29 <code>is_equal()</code> [6/6]	345
5.44.3.30 <code>isCopyNeeded()</code>	346
5.44.3.31 <code>makeCopy()</code>	346
5.45 <code>Tang::ComputedExpressionNativeLibraryFunction</code> Class Reference	347
5.45.1 Detailed Description	349
5.45.2 Constructor & Destructor Documentation	349
5.45.2.1 <code>ComputedExpressionNativeLibraryFunction()</code>	349
5.45.3 Member Function Documentation	349
5.45.3.1 <code>__add()</code>	349
5.45.3.2 <code>__asCode()</code>	350
5.45.3.3 <code>__assign_index()</code>	350
5.45.3.4 <code>__boolean()</code>	351
5.45.3.5 <code>__divide()</code>	351
5.45.3.6 <code>__equal()</code>	351
5.45.3.7 <code>__float()</code>	352
5.45.3.8 <code>__getIterator()</code>	352
5.45.3.9 <code>__index()</code>	352
5.45.3.10 <code>__integer()</code>	353
5.45.3.11 <code>__iteratorNext()</code>	353
5.45.3.12 <code>__lessThan()</code>	353
5.45.3.13 <code>__modulo()</code>	355
5.45.3.14 <code>__multiply()</code>	355
5.45.3.15 <code>__negative()</code>	356
5.45.3.16 <code>__not()</code>	356
5.45.3.17 <code>__period()</code>	356
5.45.3.18 <code>__slice()</code>	357
5.45.3.19 <code>__string()</code>	357
5.45.3.20 <code>__subtract()</code>	357
5.45.3.21 <code>dump()</code>	358
5.45.3.22 <code>getFunction()</code>	358
5.45.3.23 <code>is_equal()</code> [1/6]	358
5.45.3.24 <code>is_equal()</code> [2/6]	359
5.45.3.25 <code>is_equal()</code> [3/6]	359
5.45.3.26 <code>is_equal()</code> [4/6]	359
5.45.3.27 <code>is_equal()</code> [5/6]	360
5.45.3.28 <code>is_equal()</code> [6/6]	360
5.45.3.29 <code>isCopyNeeded()</code>	361
5.45.3.30 <code>makeCopy()</code>	361
5.46 <code>Tang::ComputedExpressionString</code> Class Reference	361
5.46.1 Detailed Description	364
5.46.2 Constructor & Destructor Documentation	364
5.46.2.1 <code>ComputedExpressionString()</code> [1/2]	364

5.46.2.2 ComputedExpressionString() [2/2]	364
5.46.3 Member Function Documentation	365
5.46.3.1 __add()	365
5.46.3.2 __asCode()	365
5.46.3.3 __assign_index()	366
5.46.3.4 __boolean()	366
5.46.3.5 __divide()	367
5.46.3.6 __equal()	367
5.46.3.7 __float()	368
5.46.3.8 __getIterator()	368
5.46.3.9 __index()	369
5.46.3.10 __integer()	369
5.46.3.11 __iteratorNext()	370
5.46.3.12 __lessThan()	370
5.46.3.13 __modulo()	371
5.46.3.14 __multiply()	371
5.46.3.15 __negative()	372
5.46.3.16 __not()	372
5.46.3.17 __period()	372
5.46.3.18 __slice()	373
5.46.3.19 __string()	374
5.46.3.20 __subtract()	374
5.46.3.21 bytesLength()	374
5.46.3.22 dump()	375
5.46.3.23 getMethods()	375
5.46.3.24 getValue()	375
5.46.3.25 is_equal() [1/6]	375
5.46.3.26 is_equal() [2/6]	376
5.46.3.27 is_equal() [3/6]	376
5.46.3.28 is_equal() [4/6]	377
5.46.3.29 is_equal() [5/6]	377
5.46.3.30 is_equal() [6/6]	378
5.46.3.31 isCopyNeeded()	378
5.46.3.32 length()	379
5.46.3.33 makeCopy()	379
5.46.3.34 operator+=()	379
5.47 Tang::Context Class Reference	380
5.47.1 Detailed Description	380
5.48 Tang::Error Class Reference	381
5.48.1 Detailed Description	382
5.48.2 Constructor & Destructor Documentation	382
5.48.2.1 Error() [1/2]	382

5.48.2.2 Error() [2/2]	382
5.48.3 Friends And Related Function Documentation	382
5.48.3.1 operator<<	383
5.49 Tang::GarbageCollected Class Reference	383
5.49.1 Detailed Description	385
5.49.2 Constructor & Destructor Documentation	385
5.49.2.1 GarbageCollected() [1/3]	385
5.49.2.2 GarbageCollected() [2/3]	386
5.49.2.3 ~GarbageCollected()	386
5.49.2.4 GarbageCollected() [3/3]	386
5.49.3 Member Function Documentation	386
5.49.3.1 isCopyNeeded()	386
5.49.3.2 make()	387
5.49.3.3 makeCopy()	387
5.49.3.4 operator"!"()	388
5.49.3.5 operator"!=()	388
5.49.3.6 operator%()	389
5.49.3.7 operator*() [1/2]	390
5.49.3.8 operator*() [2/2]	390
5.49.3.9 operator+()	390
5.49.3.10 operator-() [1/2]	391
5.49.3.11 operator-() [2/2]	391
5.49.3.12 operator->()	392
5.49.3.13 operator/()	392
5.49.3.14 operator<()	393
5.49.3.15 operator<=()	393
5.49.3.16 operator>() [1/2]	394
5.49.3.17 operator=() [2/2]	394
5.49.3.18 operator==() [1/8]	394
5.49.3.19 operator==() [2/8]	395
5.49.3.20 operator==() [3/8]	395
5.49.3.21 operator==() [4/8]	395
5.49.3.22 operator==() [5/8]	396
5.49.3.23 operator==() [6/8]	396
5.49.3.24 operator==() [7/8]	397
5.49.3.25 operator==() [8/8]	397
5.49.3.26 operator>()	398
5.49.3.27 operator>=()	398
5.49.4 Friends And Related Function Documentation	398
5.49.4.1 operator<<	399
5.50 Tang::HtmlEscape Class Reference	399
5.50.1 Detailed Description	400

5.50.2 Constructor & Destructor Documentation	400
5.50.2.1 HtmlEscape()	400
5.50.3 Member Function Documentation	401
5.50.3.1 get_next_token()	401
5.51 Tang::HtmlEscapeAscii Class Reference	401
5.51.1 Detailed Description	402
5.51.2 Constructor & Destructor Documentation	402
5.51.2.1 HtmlEscapeAscii()	402
5.51.3 Member Function Documentation	403
5.51.3.1 get_next_token()	403
5.52 Tang::location Class Reference	403
5.52.1 Detailed Description	404
5.53 Tang::PercentEncode Class Reference	405
5.53.1 Detailed Description	405
5.53.2 Constructor & Destructor Documentation	406
5.53.2.1 PercentEncode()	406
5.53.3 Member Function Documentation	406
5.53.3.1 get_next_token()	406
5.54 Tang::position Class Reference	407
5.54.1 Detailed Description	408
5.55 Tang::Program Class Reference	408
5.55.1 Detailed Description	411
5.55.2 Member Enumeration Documentation	411
5.55.2.1 CodeType	411
5.55.3 Constructor & Destructor Documentation	411
5.55.3.1 Program() [1/2]	412
5.55.3.2 Program() [2/2]	412
5.55.4 Member Function Documentation	412
5.55.4.1 addBreak()	412
5.55.4.2 addBytecode()	413
5.55.4.3 addContinue()	413
5.55.4.4 addIdentifier()	413
5.55.4.5 addIdentifierAssigned()	414
5.55.4.6 addLibraryAlias()	414
5.55.4.7 addString()	414
5.55.4.8 dumpBytecode()	414
5.55.4.9 execute() [1/2]	415
5.55.4.10 execute() [2/2]	415
5.55.4.11 getAnnotations()	416
5.55.4.12 getAst()	416
5.55.4.13 getBytecode()	416
5.55.4.14 getCode()	416

5.55.4.15 getIdentifiers()	417
5.55.4.16 getIdentifiersAssigned()	417
5.55.4.17 getLibraryAliases()	417
5.55.4.18 getResult()	417
5.55.4.19 getStrings()	418
5.55.4.20 popBreakStack()	418
5.55.4.21 popContinueStack()	418
5.55.4.22 pushEnvironment()	419
5.55.4.23 setAnnotation()	419
5.55.4.24 setFunctionStackDeclaration()	420
5.55.4.25 setJumpTarget()	420
5.55.5 Member Data Documentation	420
5.55.5.1 functionsDeclared	420
5.56 Tang::SingletonObjectPool< T > Class Template Reference	421
5.56.1 Detailed Description	422
5.56.2 Member Function Documentation	422
5.56.2.1 get()	422
5.56.2.2 getInstance()	423
5.56.2.3 recycle()	423
5.56.3 Member Data Documentation	423
5.56.3.1 currentIndex	423
5.56.3.2 currentRecycledIndex	423
5.57 Tang::TangBase Class Reference	424
5.57.1 Detailed Description	425
5.57.2 Constructor & Destructor Documentation	425
5.57.2.1 TangBase()	425
5.57.3 Member Function Documentation	425
5.57.3.1 compileScript() [1/2]	425
5.57.3.2 compileScript() [2/2]	426
5.57.3.3 compileTemplate() [1/2]	426
5.57.3.4 compileTemplate() [2/2]	426
5.57.3.5 make_shared()	428
5.58 Tang::TangScanner Class Reference	428
5.58.1 Detailed Description	429
5.58.2 Constructor & Destructor Documentation	430
5.58.2.1 TangScanner()	430
5.58.3 Member Function Documentation	430
5.58.3.1 get_next_token()	430
5.59 Tang::Unescape Class Reference	431
5.59.1 Detailed Description	431
5.59.2 Constructor & Destructor Documentation	432
5.59.2.1 Unescape()	432

5.59.3 Member Function Documentation	432
5.59.3.1 get_next_token()	432
5.60 Tang::UnicodeString Class Reference	433
5.60.1 Detailed Description	434
5.60.2 Member Enumeration Documentation	434
5.60.2.1 Type	434
5.60.3 Member Function Documentation	435
5.60.3.1 bytesLength()	435
5.60.3.2 length()	435
5.60.3.3 operator std::string()	436
5.60.3.4 operator+()	436
5.60.3.5 operator+=()	436
5.60.3.6 operator<()	437
5.60.3.7 operator==()	437
5.60.3.8 render()	437
5.60.3.9 renderAscii()	438
5.60.3.10 substr()	438
6 File Documentation	441
6.1 build/generated/location.hh File Reference	441
6.1.1 Detailed Description	442
6.1.2 Function Documentation	442
6.1.2.1 operator<<() [1/2]	442
6.1.2.2 operator<<() [2/2]	443
6.2 include/astNode.hpp File Reference	443
6.2.1 Detailed Description	444
6.3 include/astNodeArray.hpp File Reference	444
6.3.1 Detailed Description	445
6.4 include/astNodeAssign.hpp File Reference	445
6.4.1 Detailed Description	446
6.5 include/astNodeBinary.hpp File Reference	446
6.5.1 Detailed Description	446
6.6 include/astNodeBlock.hpp File Reference	447
6.6.1 Detailed Description	447
6.7 include/astNodeBoolean.hpp File Reference	448
6.7.1 Detailed Description	448
6.8 include/astNodeBreak.hpp File Reference	449
6.8.1 Detailed Description	449
6.9 include/astNodeCast.hpp File Reference	450
6.9.1 Detailed Description	450
6.10 include/astNodeContinue.hpp File Reference	451
6.10.1 Detailed Description	451

6.11 include/astNodeDoWhile.hpp File Reference	452
6.11.1 Detailed Description	452
6.12 include/astNodeFloat.hpp File Reference	453
6.12.1 Detailed Description	453
6.13 include/astNodeFor.hpp File Reference	454
6.13.1 Detailed Description	454
6.14 include/astNodeFunctionCall.hpp File Reference	455
6.14.1 Detailed Description	455
6.15 include/astNodeFunctionDeclaration.hpp File Reference	456
6.15.1 Detailed Description	456
6.16 include/astNodeIdentifier.hpp File Reference	457
6.16.1 Detailed Description	457
6.17 include/astNodeIfElse.hpp File Reference	457
6.17.1 Detailed Description	458
6.18 include/astNodeIndex.hpp File Reference	458
6.18.1 Detailed Description	459
6.19 include/astNodeInteger.hpp File Reference	459
6.19.1 Detailed Description	460
6.20 include/astNodeLibrary.hpp File Reference	460
6.20.1 Detailed Description	461
6.21 include/astNodeMap.hpp File Reference	461
6.21.1 Detailed Description	462
6.22 include/astNodePeriod.hpp File Reference	463
6.22.1 Detailed Description	463
6.23 include/astNodePrint.hpp File Reference	464
6.23.1 Detailed Description	464
6.24 include/astNodeRangedFor.hpp File Reference	465
6.24.1 Detailed Description	465
6.25 include/astNodeReturn.hpp File Reference	466
6.25.1 Detailed Description	466
6.26 include/astNodeSlice.hpp File Reference	467
6.26.1 Detailed Description	467
6.27 include/astNodeString.hpp File Reference	468
6.27.1 Detailed Description	468
6.28 include/astNodeTernary.hpp File Reference	468
6.28.1 Detailed Description	469
6.29 include/astNodeUnary.hpp File Reference	469
6.29.1 Detailed Description	470
6.30 include/astNodeUse.hpp File Reference	470
6.30.1 Detailed Description	471
6.31 include/astNodeWhile.hpp File Reference	471
6.31.1 Detailed Description	472

6.32 include/computedExpression.hpp File Reference	472
6.32.1 Detailed Description	473
6.33 include/computedExpressionArray.hpp File Reference	473
6.33.1 Detailed Description	474
6.34 include/computedExpressionBoolean.hpp File Reference	474
6.34.1 Detailed Description	475
6.35 include/computedExpressionCompiledFunction.hpp File Reference	475
6.35.1 Detailed Description	476
6.36 include/computedExpressionError.hpp File Reference	476
6.36.1 Detailed Description	477
6.37 include/computedExpressionFloat.hpp File Reference	477
6.37.1 Detailed Description	477
6.38 include/computedExpressionInteger.hpp File Reference	478
6.38.1 Detailed Description	478
6.39 include/computedExpressionIterator.hpp File Reference	478
6.39.1 Detailed Description	479
6.40 include/computedExpressionIteratorEnd.hpp File Reference	479
6.40.1 Detailed Description	480
6.41 include/computedExpressionLibrary.hpp File Reference	480
6.41.1 Detailed Description	481
6.42 include/computedExpressionLibraryMath.hpp File Reference	481
6.42.1 Detailed Description	482
6.43 include/computedExpressionLibraryTang.hpp File Reference	483
6.43.1 Detailed Description	483
6.44 include/computedExpressionMap.hpp File Reference	484
6.44.1 Detailed Description	484
6.45 include/computedExpressionNativeBoundFunction.hpp File Reference	485
6.45.1 Detailed Description	485
6.46 include/computedExpressionNativeFunction.hpp File Reference	486
6.46.1 Detailed Description	486
6.47 include/computedExpressionNativeLibraryFunction.hpp File Reference	487
6.47.1 Detailed Description	487
6.48 include/computedExpressionString.hpp File Reference	488
6.48.1 Detailed Description	488
6.49 include/context.hpp File Reference	488
6.49.1 Detailed Description	489
6.50 include/error.hpp File Reference	489
6.50.1 Detailed Description	490
6.51 include/garbageCollected.hpp File Reference	490
6.51.1 Detailed Description	491
6.52 include/htmlEscape.hpp File Reference	491
6.52.1 Detailed Description	492

6.53 include/htmlEscapeAscii.hpp File Reference	492
6.53.1 Detailed Description	493
6.54 include/macros.hpp File Reference	494
6.54.1 Detailed Description	495
6.54.2 Macro Definition Documentation	495
6.54.2.1 BINARYOP	495
6.54.2.2 OPCODE_FIND_INDEX	496
6.54.2.3 UNARYOP	496
6.55 include/opcode.hpp File Reference	496
6.55.1 Detailed Description	497
6.55.2 Enumeration Type Documentation	497
6.55.2.1 Opcode	498
6.55.3 Function Documentation	500
6.55.3.1 operator<<()	500
6.56 include/percentEncode.hpp File Reference	501
6.56.1 Detailed Description	502
6.57 include/program.hpp File Reference	502
6.57.1 Detailed Description	503
6.57.2 Typedef Documentation	503
6.57.2.1 OpcodePositions	503
6.58 include/singleObjectPool.hpp File Reference	503
6.58.1 Detailed Description	504
6.59 include/tang.hpp File Reference	504
6.59.1 Detailed Description	505
6.60 include/tangBase.hpp File Reference	505
6.60.1 Detailed Description	506
6.61 include/tangScanner.hpp File Reference	506
6.61.1 Detailed Description	507
6.62 include/unescape.hpp File Reference	508
6.62.1 Detailed Description	508
6.63 include/unicodeString.hpp File Reference	509
6.63.1 Detailed Description	509
6.63.2 Function Documentation	510
6.63.2.1 htmlEscape()	510
6.63.2.2 htmlEscapeAscii()	510
6.63.2.3 percentEncode()	511
6.63.2.4 unescape()	512
6.64 src/astNode.cpp File Reference	512
6.64.1 Detailed Description	513
6.65 src/astNodeArray.cpp File Reference	513
6.65.1 Detailed Description	513
6.66 src/astNodeAssign.cpp File Reference	514

6.66.1 Detailed Description	514
6.67 src/astNodeBinary.cpp File Reference	514
6.67.1 Detailed Description	515
6.67.2 Macro Definition Documentation	515
6.67.2.1 LOGICALOP	515
6.68 src/astNodeBlock.cpp File Reference	515
6.68.1 Detailed Description	516
6.69 src/astNodeBoolean.cpp File Reference	516
6.69.1 Detailed Description	516
6.70 src/astNodeBreak.cpp File Reference	517
6.70.1 Detailed Description	517
6.71 src/astNodeCast.cpp File Reference	517
6.71.1 Detailed Description	518
6.72 src/astNodeContinue.cpp File Reference	518
6.72.1 Detailed Description	518
6.73 src/astNodeDoWhile.cpp File Reference	518
6.73.1 Detailed Description	519
6.74 src/astNodeFloat.cpp File Reference	519
6.74.1 Detailed Description	519
6.75 src/astNodeFor.cpp File Reference	519
6.75.1 Detailed Description	520
6.76 src/astNodeFunctionCall.cpp File Reference	520
6.76.1 Detailed Description	520
6.77 src/astNodeFunctionDeclaration.cpp File Reference	520
6.77.1 Detailed Description	521
6.78 src/astNodeIdentifier.cpp File Reference	521
6.78.1 Detailed Description	521
6.79 src/astNodeIfElse.cpp File Reference	521
6.79.1 Detailed Description	522
6.80 src/astNodeIndex.cpp File Reference	522
6.80.1 Detailed Description	522
6.81 src/astNodeInteger.cpp File Reference	522
6.81.1 Detailed Description	523
6.82 src/astNodeLibrary.cpp File Reference	523
6.82.1 Detailed Description	523
6.83 src/astNodeMap.cpp File Reference	523
6.83.1 Detailed Description	524
6.84 src/astNodePeriod.cpp File Reference	524
6.84.1 Detailed Description	524
6.85 src/astNodePrint.cpp File Reference	524
6.85.1 Detailed Description	525
6.86 src/astNodeRangedFor.cpp File Reference	525

6.86.1 Detailed Description	525
6.87 src/astNodeReturn.cpp File Reference	526
6.87.1 Detailed Description	526
6.88 src/astNodeSlice.cpp File Reference	526
6.88.1 Detailed Description	527
6.89 src/astNodeString.cpp File Reference	527
6.89.1 Detailed Description	527
6.90 src/astNodeTernary.cpp File Reference	527
6.90.1 Detailed Description	528
6.91 src/astNodeUnary.cpp File Reference	528
6.91.1 Detailed Description	528
6.92 src/astNodeUse.cpp File Reference	529
6.92.1 Detailed Description	529
6.93 src/astNodeWhile.cpp File Reference	529
6.93.1 Detailed Description	530
6.94 src/computedExpression.cpp File Reference	530
6.94.1 Detailed Description	530
6.95 src/computedExpressionArray.cpp File Reference	530
6.95.1 Detailed Description	531
6.96 src/computedExpressionBoolean.cpp File Reference	531
6.96.1 Detailed Description	531
6.97 src/computedExpressionCompiledFunction.cpp File Reference	532
6.97.1 Detailed Description	532
6.98 src/computedExpressionError.cpp File Reference	532
6.98.1 Detailed Description	533
6.99 src/computedExpressionFloat.cpp File Reference	533
6.99.1 Detailed Description	533
6.100 src/computedExpressionInteger.cpp File Reference	533
6.100.1 Detailed Description	534
6.101 src/computedExpressionIterator.cpp File Reference	534
6.101.1 Detailed Description	534
6.102 src/computedExpressionIteratorEnd.cpp File Reference	535
6.102.1 Detailed Description	535
6.103 src/computedExpressionLibrary.cpp File Reference	535
6.103.1 Detailed Description	536
6.104 src/computedExpressionLibraryMath.cpp File Reference	536
6.104.1 Detailed Description	536
6.105 src/computedExpressionLibraryTang.cpp File Reference	536
6.105.1 Detailed Description	537
6.106 src/computedExpressionMap.cpp File Reference	537
6.106.1 Detailed Description	537
6.107 src/computedExpressionNativeBoundFunction.cpp File Reference	538

6.107.1 Detailed Description	538
6.108 src/computedExpressionNativeFunction.cpp File Reference	538
6.108.1 Detailed Description	539
6.109 src/computedExpressionNativeLibraryFunction.cpp File Reference	539
6.109.1 Detailed Description	539
6.110 src/computedExpressionString.cpp File Reference	539
6.110.1 Detailed Description	540
6.111 src/context.cpp File Reference	540
6.111.1 Detailed Description	540
6.112 src/error.cpp File Reference	541
6.112.1 Detailed Description	541
6.112.2 Function Documentation	541
6.112.2.1 operator<<()	541
6.113 src/garbageCollected.cpp File Reference	542
6.113.1 Function Documentation	542
6.113.1.1 operator<<()	542
6.114 src/opcode.cpp File Reference	543
6.114.1 Detailed Description	543
6.115 src/program-analyze.cpp File Reference	543
6.115.1 Detailed Description	544
6.115.2 Macro Definition Documentation	544
6.115.2.1 DUMPPROGRAMCHECK	544
6.116 src/program-dumpBytecode.cpp File Reference	545
6.116.1 Detailed Description	545
6.116.2 Macro Definition Documentation	545
6.116.2.1 DUMPBINARY	545
6.116.2.2 DUMPBINARY_I	546
6.116.2.3 DUMPBINARY_II	546
6.116.2.4 DUMPPROGRAMCHECK	546
6.117 src/program-execute.cpp File Reference	546
6.117.1 Detailed Description	547
6.117.2 Macro Definition Documentation	547
6.117.2.1 BINARYOP_II	548
6.117.2.2 BINARYOP_IS	548
6.117.2.3 BINARYOP_SI	548
6.117.2.4 BINARYOP_SS	548
6.117.2.5 CASTOP_I	549
6.117.2.6 CASTOP_S	549
6.117.2.7 EXECUTEPROGRAMCHECK	549
6.117.2.8 PRINTOP_I	549
6.117.2.9 PRINTOP_S	550
6.117.2.10 STACKCHECK	550

6.117.2.11 UNARYOP_I	550
6.117.2.12 UNARYOP_S	550
6.118 src/program-optimize.cpp File Reference	551
6.118.1 Detailed Description	551
6.119 src/program.cpp File Reference	551
6.119.1 Detailed Description	552
6.120 src/tang.cpp File Reference	552
6.120.1 Detailed Description	552
6.121 src/tangBase.cpp File Reference	552
6.121.1 Detailed Description	553
6.121.2 Macro Definition Documentation	553
6.121.2.1 LIBRARY	553
6.122 src/unicodeString.cpp File Reference	553
6.122.1 Detailed Description	554
6.123 test/test.cpp File Reference	554
6.123.1 Detailed Description	556
6.124 test/testGarbageCollected.cpp File Reference	556
6.124.1 Detailed Description	556
6.125 test/testSingletonObjectPool.cpp File Reference	557
6.125.1 Detailed Description	557
6.126 test/testUnicodeString.cpp File Reference	557
6.126.1 Detailed Description	558
Index	559

Chapter 1

Tang: A Template Language

1.1 Quick Description

Tang is a C++ Template Language. It takes the form of a library which may be included in other projects. It is under active development, and you can follow its progress here:

- [YouTube playlist](#)
- [GitHub repository](#)

1.2 Features

The following features are planned:

- Native support for Unicode/Utf-8 strings.
- Change from template to script mode using escape tags like PHP.
- Loosely typed, with Python-like indexing and slicing of containers.
- Syntax similar to C/C++/PHP.
- Code compiles to a custom Bytecode and is executed by the Tang VM.
- Fast and thread-safe.

1.3 License

MIT License

Copyright (c) 2022 Corey Pennycuff

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Chapter 2

Hierarchical Index

2.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

Tang::AstNode	15
Tang::AstNodeArray	21
Tang::AstNodeAssign	25
Tang::AstNodeBinary	29
Tang::AstNodeBlock	35
Tang::AstNodeBoolean	39
Tang::AstNodeBreak	43
Tang::AstNodeCast	47
Tang::AstNodeContinue	51
Tang::AstNodeDoWhile	55
Tang::AstNodeFloat	60
Tang::AstNodeFor	64
Tang::AstNodeFunctionCall	69
Tang::AstNodeFunctionDeclaration	72
Tang::AstNodeIdentifier	76
Tang::AstNodeIfElse	81
Tang::AstNodeIndex	86
Tang::AstNodeInteger	91
Tang::AstNodeLibrary	95
Tang::AstNodeMap	99
Tang::AstNodePeriod	103
Tang::AstNodePrint	107
Tang::AstNodeRangedFor	111
Tang::AstNodeReturn	116
Tang::AstNodeSlice	120
Tang::AstNodeString	125
Tang::AstNodeTernary	131
Tang::AstNodeUnary	135
Tang::AstNodeUse	141
Tang::AstNodeWhile	145
Tang::ComputedExpression	150
Tang::ComputedExpressionArray	163
Tang::ComputedExpressionBoolean	179
Tang::ComputedExpressionCompiledFunction	191
Tang::ComputedExpressionError	204

Tang::ComputedExpressionFloat	217
Tang::ComputedExpressionInteger	231
Tang::ComputedExpressionIterator	246
Tang::ComputedExpressionIteratorEnd	260
Tang::ComputedExpressionLibrary	274
Tang::ComputedExpressionLibraryBase	288
Tang::ComputedExpressionMap	302
Tang::ComputedExpressionNativeBoundFunction	316
Tang::ComputedExpressionNativeFunction	332
Tang::ComputedExpressionNativeLibraryFunction	347
Tang::ComputedExpressionString	361
Tang::Context	380
std::enable_shared_from_this	
Tang::TangBase	424
Tang::Error	381
Tang::GarbageCollected	383
Tang::location	403
Tang::position	407
Tang::Program	408
Tang::SingletonObjectPool< T >	421
TangHtmlEscapeAsciiFlexLexer	
Tang::HtmlEscapeAscii	401
TangHtmlEscapeFlexLexer	
Tang::HtmlEscape	399
TangPercentEncodeFlexLexer	
Tang::PercentEncode	405
TangTangFlexLexer	
Tang::TangScanner	428
TangUnescapeFlexLexer	
Tang::Unescape	431
Tang::UnicodeString	433

Chapter 3

Class Index

3.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

Tang::AstNode	Base class for representing nodes of an Abstract Syntax Tree (AST)	15
Tang::AstNodeArray	An <code>AstNode</code> that represents an array literal	21
Tang::AstNodeAssign	An <code>AstNode</code> that represents a binary expression	25
Tang::AstNodeBinary	An <code>AstNode</code> that represents a binary expression	29
Tang::AstNodeBlock	An <code>AstNode</code> that represents a code block	35
Tang::AstNodeBoolean	An <code>AstNode</code> that represents a boolean literal	39
Tang::AstNodeBreak	An <code>AstNode</code> that represents a <code>break</code> statement	43
Tang::AstNodeCast	An <code>AstNode</code> that represents a typecast of an expression	47
Tang::AstNodeContinue	An <code>AstNode</code> that represents a <code>continue</code> statement	51
Tang::AstNodeDoWhile	An <code>AstNode</code> that represents a <code>do..while</code> statement	55
Tang::AstNodeFloat	An <code>AstNode</code> that represents an float literal	60
Tang::AstNodeFor	An <code>AstNode</code> that represents an <code>if()</code> statement	64
Tang::AstNodeFunctionCall	An <code>AstNode</code> that represents a function call	69
Tang::AstNodeFunctionDeclaration	An <code>AstNode</code> that represents a function declaration	72
Tang::AstNodeIdentifier	An <code>AstNode</code> that represents an identifier	76
Tang::AstNodeIfElse	An <code>AstNode</code> that represents an <code>if..else</code> statement	81
Tang::AstNodeIndex	An <code>AstNode</code> that represents an index into a collection	86
Tang::AstNodeInteger	An <code>AstNode</code> that represents an integer literal	91

Tang::AstNodeLibrary	An <code>AstNode</code> that represents an identifier	95
Tang::AstNodeMap	An <code>AstNode</code> that represents a map literal	99
Tang::AstNodePeriod	An <code>AstNode</code> that represents a member access (period) into an object	103
Tang::AstNodePrint	An <code>AstNode</code> that represents a print typeeration	107
Tang::AstNodeRangedFor	An <code>AstNode</code> that represents a ranged for() statement	111
Tang::AstNodeReturn	An <code>AstNode</code> that represents a <code>return</code> statement	116
Tang::AstNodeSlice	An <code>AstNode</code> that represents a ternary expression	120
Tang::AstNodeString	An <code>AstNode</code> that represents a string literal	125
Tang::AstNodeTernary	An <code>AstNode</code> that represents a ternary expression	131
Tang::AstNodeUnary	An <code>AstNode</code> that represents a unary negation	135
Tang::AstNodeUse	An <code>AstNode</code> that represents the inclusion of a library into the script	141
Tang::AstNodeWhile	An <code>AstNode</code> that represents a while statement	145
Tang::ComputedExpression	Represents the result of a computation that has been executed	150
Tang::ComputedExpressionArray	Represents an Array that is the result of a computation	163
Tang::ComputedExpressionBoolean	Represents an Boolean that is the result of a computation	179
Tang::ComputedExpressionCompiledFunction	Represents a Compiled Function declared in the script	191
Tang::ComputedExpressionError	Represents a Runtime <code>Error</code>	204
Tang::ComputedExpressionFloat	Represents a Float that is the result of a computation	217
Tang::ComputedExpressionInteger	Represents an Integer that is the result of a computation	231
Tang::ComputedExpressionIterator	Represents an Iterator that is the result of a computation	246
Tang::ComputedExpressionIteratorEnd	Represents that a collection has no more values through which to iterate	260
Tang::ComputedExpressionLibrary	Represents a Runtime Library	274
Tang::ComputedExpressionLibraryBase		288
Tang::ComputedExpressionMap	Represents an Map that is the result of a computation	302
Tang::ComputedExpressionNativeBoundFunction	Represents a NativeBound Function declared in the script	316
Tang::ComputedExpressionNativeFunction	Represents a Native Function provided by compiled C++ code	332
Tang::ComputedExpressionNativeLibraryFunction	Represents a Native Function provided by compiled C++ code that is executed to create a library or one of its attributes	347
Tang::ComputedExpressionString	Represents a String that is the result of a computation	361
Tang::Context	Holds all environment variables specific to the execution of a program	380

Tang::Error	Used to report any error of the system, whether a syntax (parsing) error or a runtime (execution) error	381
Tang::GarbageCollected	A container that acts as a resource-counting garbage collector for the specified type	383
Tang::HtmlEscape	The Flex lexer class for the main Tang language	399
Tang::HtmlEscapeAscii	The Flex lexer class for the main Tang language	401
Tang::location	Two points in a source file	403
Tang::PercentEncode	The Flex lexer class for the Percent Encode scanner	405
Tang::position	A point in a source file	407
Tang::Program	Represents a compiled script or template that may be executed	408
Tang::SingletonObjectPool< T >	A thread-safe, singleton object pool of the designated type	421
Tang::TangBase	The base class for the Tang programming language	424
Tang::TangScanner	The Flex lexer class for the main Tang language	428
Tang::Unescape	The Flex lexer class for the main Tang language	431
Tang::UnicodeString	Represents a UTF-8 encoded string that is Unicode-aware	433

Chapter 4

File Index

4.1 File List

Here is a list of all documented files with brief descriptions:

build/generated/ location.hh	Define the Tang ::location class	441
include/ astNode.hpp	Declare the Tang::AstNode base class	443
include/ astNodeArray.hpp	Declare the Tang::AstNodeArray class	444
include/ astNodeAssign.hpp	Declare the Tang::AstNodeAssign class	445
include/ astNodeBinary.hpp	Declare the Tang::AstNodeBinary class	446
include/ astNodeBlock.hpp	Declare the Tang::AstNodeBlock class	447
include/ astNodeBoolean.hpp	Declare the Tang::AstNodeBoolean class	448
include/ astNodeBreak.hpp	Declare the Tang::AstNodeBreak class	449
include/ astNodeCast.hpp	Declare the Tang::AstNodeCast class	450
include/ astNodeContinue.hpp	Declare the Tang::AstNodeContinue class	451
include/ astNodeDoWhile.hpp	Declare the Tang::AstNodeDoWhile class	452
include/ astNodeFloat.hpp	Declare the Tang::AstNodeFloat class	453
include/ astNodeFor.hpp	Declare the Tang::AstNodeFor class	454
include/ astNodeFunctionCall.hpp	Declare the Tang::AstNodeFunctionCall class	455
include/ astNodeFunctionDeclaration.hpp	Declare the Tang::AstNodeFunctionDeclaration class	456
include/ astNodeIdentifier.hpp	Declare the Tang::AstNodeIdentifier class	457
include/ astNodeIfElse.hpp	Declare the Tang::AstNodeIfElse class	457
include/ astNodeIndex.hpp	Declare the Tang::AstNodeIndex class	458

include/astNodeInteger.hpp	
Declare the Tang::AstNodeInteger class	459
include/astNodeLibrary.hpp	
Declare the Tang::AstNodeLibrary class	460
include/astNodeMap.hpp	
Declare the Tang::AstNodeMap class	461
include/astNodePeriod.hpp	
Declare the Tang::AstNodePeriod class	463
include/astNodePrint.hpp	
Declare the Tang::AstNodePrint class	464
include/astNodeRangedFor.hpp	
Declare the Tang::AstNodeRangedFor class	465
include/astNodeReturn.hpp	
Declare the Tang::AstNodeReturn class	466
include/astNodeSlice.hpp	
Declare the Tang::AstNodeSlice class	467
include/astNodeString.hpp	
Declare the Tang::AstNodeString class	468
include/astNodeTernary.hpp	
Declare the Tang::AstNodeTernary class	468
include/astNodeUnary.hpp	
Declare the Tang::AstNodeUnary class	469
include/astNodeUse.hpp	
Declare the Tang::AstNodeUse class	470
include/astNodeWhile.hpp	
Declare the Tang::AstNodeWhile class	471
include/computedExpression.hpp	
Declare the Tang::ComputedExpression base class	472
include/computedExpressionArray.hpp	
Declare the Tang::ComputedExpressionArray class	473
include/computedExpressionBoolean.hpp	
Declare the Tang::ComputedExpressionBoolean class	474
include/computedExpressionCompiledFunction.hpp	
Declare the Tang::ComputedExpressionCompiledFunction class	475
include/computedExpressionError.hpp	
Declare the Tang::ComputedExpressionError class	476
include/computedExpressionFloat.hpp	
Declare the Tang::ComputedExpressionFloat class	477
include/computedExpressionInteger.hpp	
Declare the Tang::ComputedExpressionInteger class	478
include/computedExpressionIterator.hpp	
Declare the Tang::ComputedExpressionIterator class	478
include/computedExpressionIteratorEnd.hpp	
Declare the Tang::ComputedExpressionIteratorEnd class	479
include/computedExpressionLibrary.hpp	
Declare the Tang::ComputedExpressionLibrary class	480
include/computedExpressionLibraryBase.hpp	
??	
include/computedExpressionLibraryMath.hpp	
Declare the Tang::ComputedExpressionLibraryMath class	481
include/computedExpressionLibraryTang.hpp	
Declare the Tang::ComputedExpressionLibraryTang class	483
include/computedExpressionMap.hpp	
Declare the Tang::ComputedExpressionMap class	484
include/computedExpressionNativeBoundFunction.hpp	
Declare the Tang::ComputedExpressionNativeBoundFunction class	485
include/computedExpressionNativeFunction.hpp	
Declare the Tang::ComputedExpressionNativeFunction class	486

include/computedExpressionNativeLibraryFunction.hpp	Declare the <code>Tang::ComputedExpressionNativeLibraryFunction</code> class	487
include/computedExpressionString.hpp	Declare the <code>Tang::ComputedExpressionString</code> class	488
include/context.hpp	Declare the <code>Tang::Context</code> class	488
include/error.hpp	Declare the <code>Tang::Error</code> class used to describe syntax and runtime errors	489
include/garbageCollected.hpp	Declare the <code>Tang::GarbageCollected</code> class	490
include/htmlEscape.hpp	Declare the <code>Tang::HtmlEscape</code> used to tokenize a Tang script	491
include/htmlEscapeAscii.hpp	Declare the <code>Tang::HtmlEscapeAscii</code> used to tokenize a Tang script	492
include/macros.hpp	Contains generic macros	494
include/opcode.hpp	Declare the Opcodes used in the Bytecode representation of a program	496
include/percentEncode.hpp	Declare the <code>Tang::PercentEncode</code> used to tokenize a Tang script	501
include/program.hpp	Declare the <code>Tang::Program</code> class used to compile and execute source code	502
include/singleObjectPool.hpp	Declare the <code>Tang::SingletonObjectPool</code> class	503
include/tang.hpp	Header file supplied for use by 3rd party code so that they can easily include all necessary headers	504
include/tangBase.hpp	Declare the <code>Tang::TangBase</code> class used to interact with Tang	505
include/tangScanner.hpp	Declare the <code>Tang::TangScanner</code> used to tokenize a Tang script	506
include/unescape.hpp	Declare the <code>Tang::Unescape</code> used to tokenize a Tang script	508
include/unicodeString.hpp	Contains the code to interface with the ICU library	509
src/astNode.cpp	Define the <code>Tang::AstNode</code> class	512
src/astNodeArray.cpp	Define the <code>Tang::AstNodeArray</code> class	513
src/astNodeAssign.cpp	Define the <code>Tang::AstNodeAssign</code> class	514
src/astNodeBinary.cpp	Define the <code>Tang::AstNodeBinary</code> class	514
src/astNodeBlock.cpp	Define the <code>Tang::AstNodeBlock</code> class	515
src/astNodeBoolean.cpp	Define the <code>Tang::AstNodeBoolean</code> class	516
src/astNodeBreak.cpp	Define the <code>Tang::AstNodeBreak</code> class	517
src/astNodeCast.cpp	Define the <code>Tang::AstNodeCast</code> class	517
src/astNodeContinue.cpp	Define the <code>Tang::AstNodeContinue</code> class	518
src/astNodeDoWhile.cpp	Define the <code>Tang::AstNodeDoWhile</code> class	518
src/astNodeFloat.cpp	Define the <code>Tang::AstNodeFloat</code> class	519

src/astNodeFor.cpp	Define the Tang::AstNodeFor class	519
src/astNodeFunctionCall.cpp	Define the Tang::AstNodeFunctionCall class	520
src/astNodeFunctionDeclaration.cpp	Define the Tang::AstNodeFunctionDeclaration class	520
src/astNodeIdentifier.cpp	Define the Tang::AstNodeIdentifier class	521
src/astNodeIfElse.cpp	Define the Tang::AstNodeIfElse class	521
src/astNodeIndex.cpp	Define the Tang::AstNodeIndex class	522
src/astNodeInteger.cpp	Define the Tang::AstNodeInteger class	522
src/astNodeLibrary.cpp	Define the Tang::AstNodeLibrary class	523
src/astNodeMap.cpp	Define the Tang::AstNodeMap class	523
src/astNodePeriod.cpp	Define the Tang::AstNodePeriod class	524
src/astNodePrint.cpp	Define the Tang::AstNodePrint class	524
src/astNodeRangedFor.cpp	Define the Tang::AstNodeRangedFor class	525
src/astNodeReturn.cpp	Define the Tang::AstNodeReturn class	526
src/astNodeSlice.cpp	Define the Tang::AstNodeSlice class	526
src/astNodeString.cpp	Define the Tang::AstNodeString class	527
src/astNodeTernary.cpp	Define the Tang::AstNodeTernary class	527
src/astNodeUnary.cpp	Define the Tang::AstNodeUnary class	528
src/astNodeUse.cpp	Define the Tang::AstNodeUse class	529
src/astNodeWhile.cpp	Define the Tang::AstNodeWhile class	529
src/computedExpression.cpp	Define the Tang::ComputedExpression class	530
src/computedExpressionArray.cpp	Define the Tang::ComputedExpressionArray class	530
src/computedExpressionBoolean.cpp	Define the Tang::ComputedExpressionBoolean class	531
src/computedExpressionCompiledFunction.cpp	Define the Tang::ComputedExpressionCompiledFunction class	532
src/computedExpressionError.cpp	Define the Tang::ComputedExpressionError class	532
src/computedExpressionFloat.cpp	Define the Tang::ComputedExpressionFloat class	533
src/computedExpressionInteger.cpp	Define the Tang::ComputedExpressionInteger class	533
src/computedExpressionIterator.cpp	Define the Tang::ComputedExpressionIterator class	534
src/computedExpressionIteratorEnd.cpp	Define the Tang::ComputedExpressionIteratorEnd class	535
src/computedExpressionLibrary.cpp	Define the Tang::ComputedExpressionLibrary class	535

src/computedExpressionLibraryMath.cpp	Define the Tang::ComputedExpressionLibraryMath class	536
src/computedExpressionLibraryTang.cpp	Define the Tang::ComputedExpressionLibraryTang class	536
src/computedExpressionMap.cpp	Define the Tang::ComputedExpressionMap class	537
src/computedExpressionNativeBoundFunction.cpp	Define the Tang::ComputedExpressionNativeBoundFunction class	538
src/computedExpressionNativeFunction.cpp	Define the Tang::ComputedExpressionNativeFunction class	538
src/computedExpressionNativeLibraryFunction.cpp	Define the Tang::ComputedExpressionNativeLibraryFunction class	539
src/computedExpressionString.cpp	Define the Tang::ComputedExpressionString class	539
src/context.cpp	Define the Tang::Context class	540
src/error.cpp	Define the Tang::Error class	541
src/garbageCollected.cpp	542
src/opcode.cpp	Define the Tang::Program::dumpBytecode method	543
src/program-analyze.cpp	Define the Tang::Program::analyze method	543
src/program-dumpBytecode.cpp	Define the Tang::Program::dumpBytecode method	545
src/program-execute.cpp	Define the Tang::Program::execute method	546
src/program-optimize.cpp	Define the Tang::Program::optimize method	551
src/program.cpp	Define the Tang::Program class	551
src/tang.cpp	Code for the Tang command line interpreter	552
src/tangBase.cpp	Define the Tang::TangBase class	552
src/unicodeString.cpp	Contains the function declarations for the Tang::UnicodeString class and the interface to ICU	553
test/test.cpp	Test the general language behaviors	554
test/testGarbageCollected.cpp	Test the generic behavior of the Tang::GarbageCollected class	556
test/testSingletonObjectPool.cpp	Test the generic behavior of the Tang::SingletonObjectPool class	557
test/testUnicodeString.cpp	Contains tests for the Tang::UnicodeString class	557

Chapter 5

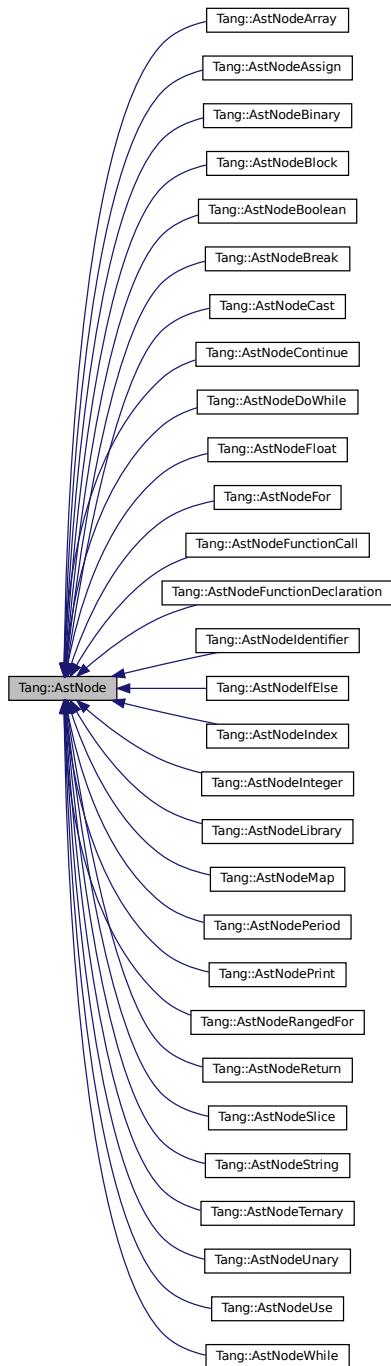
Class Documentation

5.1 Tang::AstNode Class Reference

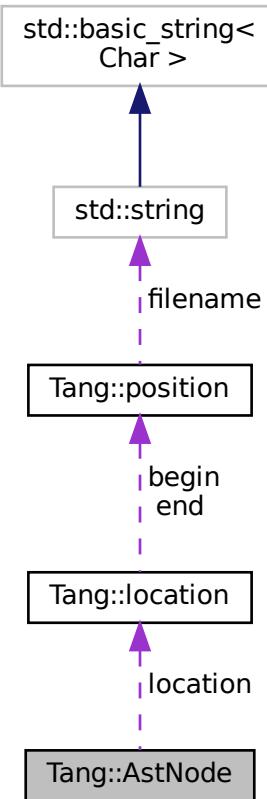
Base class for representing nodes of an Abstract Syntax Tree (AST).

```
#include <astNode.hpp>
```

Inheritance diagram for Tang::AstNode:



Collaboration diagram for Tang::AstNode:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNode (Tang::location location)`
The generic constructor.
- `virtual ~AstNode ()`
The object destructor.
- `virtual std::string dump (std::string indent="") const`
Return a string that describes the contents of the node.
- `virtual void compile (Tang::Program &program) const`
Compile the ast of the provided `Tang::Program`.
- `virtual void compilePreprocess (Program &program, PreprocessState state) const`
Run any preprocess analysis needed before compilation.

Public Attributes

- `Tang::location location`
The location associated with this node.

5.1.1 Detailed Description

Base class for representing nodes of an Abstract Syntax Tree (AST).

By default, it will represent a NULL value. There will be *many* derived classes, each one conveying the syntactic meaning of the code that it represents.

5.1.2 Member Enumeration Documentation

5.1.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	<code>AstNode</code> is part of an assignment expression.

5.1.3 Constructor & Destructor Documentation

5.1.3.1 AstNode()

```
AstNode::AstNode (
    Tang::location location )
```

The generic constructor.

It should never be called on its own.

Parameters

<code>location</code>	The location associated with this node.
-----------------------	---

5.1.4 Member Function Documentation

5.1.4.1 compile()

```
void AstNode::compile (
    Tang::Program & program ) const [virtual]
```

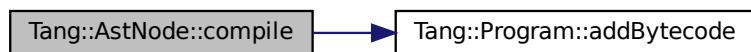
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented in [Tang::AstNodeWhile](#), [Tang::AstNodeUse](#), [Tang::AstNodeUnary](#), [Tang::AstNodeTernary](#), [Tang::AstNodeString](#), [Tang::AstNodeSlice](#), [Tang::AstNodeReturn](#), [Tang::AstNodeRangedFor](#), [Tang::AstNodePrint](#), [Tang::AstNodePeriod](#), [Tang::AstNodeMap](#), [Tang::AstNodeLibrary](#), [Tang::AstNodeInteger](#), [Tang::AstNodeIndex](#), [Tang::AstNodeIfElse](#), [Tang::AstNodeIdentifier](#), [Tang::AstNodeFunctionDeclaration](#), [Tang::AstNodeFunctionCall](#), [Tang::AstNodeFor](#), [Tang::AstNodeFloat](#), [Tang::AstNodeDoWhile](#), [Tang::AstNodeContinue](#), [Tang::AstNodeCast](#), [Tang::AstNodeBreak](#), [Tang::AstNodeBoolean](#), [Tang::AstNodeBlock](#), [Tang::AstNodeBinary](#), [Tang::AstNodeAssign](#), and [Tang::AstNodeArray](#).

Here is the call graph for this function:



5.1.4.2 compilePreprocess()

```
void AstNode::compilePreprocess (
    Program & program,
    PreprocessState state ) const [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented in [Tang::AstNodeWhile](#), [Tang::AstNodeUse](#), [Tang::AstNodeUnary](#), [Tang::AstNodeTernary](#),

`Tang::AstNodeString`, `Tang::AstNodeSlice`, `Tang::AstNodeReturn`, `Tang::AstNodeRangedFor`, `Tang::AstNodePrint`, `Tang::AstNodePeriod`, `Tang::AstNodeMap`, `Tang::AstNodeLibrary`, `Tang::AstNodeIndex`, `Tang::AstNodeIfElse`, `Tang::AstNodeIdentifier`, `Tang::AstNodeFunctionDeclaration`, `Tang::AstNodeFunctionCall`, `Tang::AstNodeFor`, `Tang::AstNodeDoWhile`, `Tang::AstNodeCast`, `Tang::AstNodeBlock`, `Tang::AstNodeBinary`, `Tang::AstNodeAssign`, and `Tang::AstNodeArray`.

5.1.4.3 `dump()`

```
string AstNode::dump (
    std::string indent = "" ) const [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented in `Tang::AstNodeWhile`, `Tang::AstNodeUse`, `Tang::AstNodeUnary`, `Tang::AstNodeTernary`, `Tang::AstNodeString`, `Tang::AstNodeSlice`, `Tang::AstNodeReturn`, `Tang::AstNodeRangedFor`, `Tang::AstNodePrint`, `Tang::AstNodePeriod`, `Tang::AstNodeMap`, `Tang::AstNodeLibrary`, `Tang::AstNodeInteger`, `Tang::AstNodeIndex`, `Tang::AstNodeIfElse`, `Tang::AstNodeIdentifier`, `Tang::AstNodeFunctionDeclaration`, `Tang::AstNodeFunctionCall`, `Tang::AstNodeFor`, `Tang::AstNodeFloat`, `Tang::AstNodeDoWhile`, `Tang::AstNodeContinue`, `Tang::AstNodeCast`, `Tang::AstNodeBreak`, `Tang::AstNodeBoolean`, `Tang::AstNodeBlock`, `Tang::AstNodeBinary`, `Tang::AstNodeAssign`, and `Tang::AstNodeArray`.

Here is the call graph for this function:



The documentation for this class was generated from the following files:

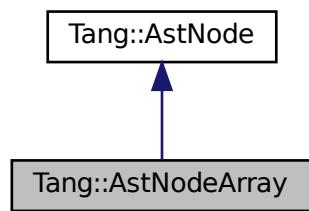
- include/astNode.hpp
- src/astNode.cpp

5.2 Tang::AstNodeArray Class Reference

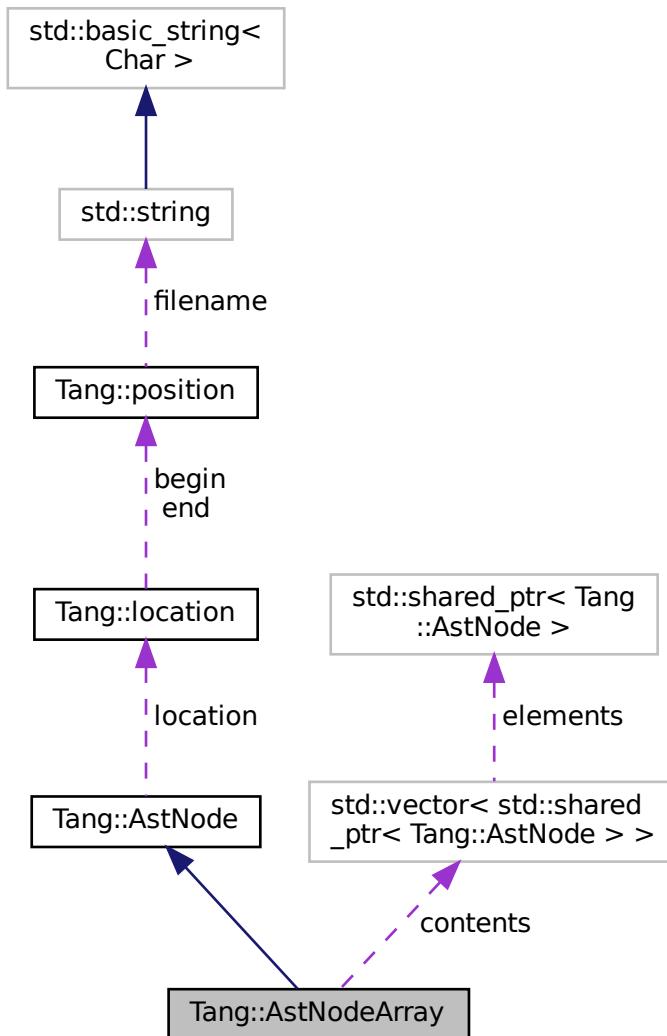
An [AstNode](#) that represents an array literal.

```
#include <astNodeArray.hpp>
```

Inheritance diagram for Tang::AstNodeArray:



Collaboration diagram for Tang::AstNodeArray:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodeArray (std::vector< std::shared_ptr< Tang::AstNode >> contents, Tang::location location)`
The constructor.
- `virtual std::string dump (std::string indent="") const override`
Return a string that describes the contents of the node.
- `virtual void compile (Tang::Program &program) const override`

Compile the ast of the provided [Tang::Program](#).

- virtual void [compilePreprocess](#) ([Program](#) &program, [PreprocessState](#) state) const override
Run any preprocess analysis needed before compilation.

Public Attributes

- [Tang::location](#) location
The location associated with this node.

Private Attributes

- std::vector< std::shared_ptr< [Tang::AstNode](#) > > contents
The contents of the array.

5.2.1 Detailed Description

An [AstNode](#) that represents an array literal.

5.2.2 Member Enumeration Documentation

5.2.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	AstNode is part of an assignment expression.

5.2.3 Constructor & Destructor Documentation

5.2.3.1 AstNodeArray()

```
AstNodeArray::AstNodeArray (
    std::vector< std::shared_ptr< Tang::AstNode > > contents,
    Tang::location location )
```

The constructor.

Parameters

<i>contents</i>	The contents of the array.
<i>location</i>	The location associated with the expression.

5.2.4 Member Function Documentation**5.2.4.1 compile()**

```
void AstNodeArray::compile (
    Tang::Program & program ) const [override], [virtual]
```

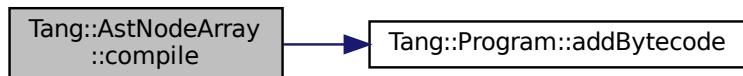
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:

**5.2.4.2 compilePreprocess()**

```
void AstNodeArray::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

5.2.4.3 dump()

```
string AstNodeArray::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

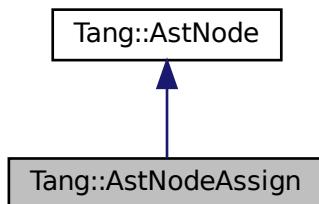
- [include/astNodeArray.hpp](#)
- [src/astNodeArray.cpp](#)

5.3 Tang::AstNodeAssign Class Reference

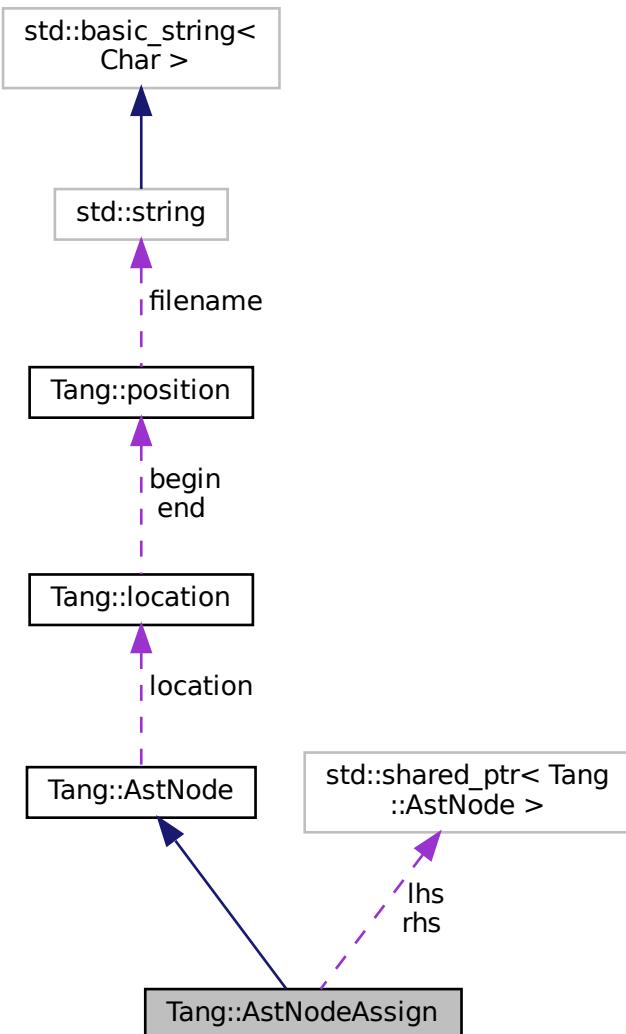
An [AstNode](#) that represents a binary expression.

```
#include <astNodeAssign.hpp>
```

Inheritance diagram for Tang::AstNodeAssign:



Collaboration diagram for Tang::AstNodeAssign:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodeAssign (std::shared_ptr< AstNode > lhs, std::shared_ptr< AstNode > rhs, Tang::location location)`
The constructor.
- `virtual std::string dump (std::string indent="") const override`
Return a string that describes the contents of the node.
- `virtual void compile (Tang::Program &program) const override`

Compile the ast of the provided [Tang::Program](#).

- virtual void [compilePreprocess](#) ([Program](#) &program, [PreprocessState](#) state) const override
Run any preprocess analysis needed before compilation.

Public Attributes

- [Tang::location](#) location
The location associated with this node.

Private Attributes

- std::shared_ptr<[AstNode](#)> lhs
The left hand side expression.
- std::shared_ptr<[AstNode](#)> rhs
The right hand side expression.

5.3.1 Detailed Description

An [AstNode](#) that represents a binary expression.

5.3.2 Member Enumeration Documentation

5.3.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	AstNode is part of an assignment expression.

5.3.3 Constructor & Destructor Documentation

5.3.3.1 AstNodeAssign()

```
AstNodeAssign::AstNodeAssign (
    std::shared_ptr<AstNode> lhs,
```

```
std::shared_ptr< AstNode > rhs,
Tang::location location )
```

The constructor.

Parameters

<i>lhs</i>	The left hand side expression.
<i>rhs</i>	The right hand side expression.
<i>location</i>	The location associated with the expression.

5.3.4 Member Function Documentation

5.3.4.1 compile()

```
void AstNodeAssign::compile (
    Tang::Program & program ) const [override], [virtual]
```

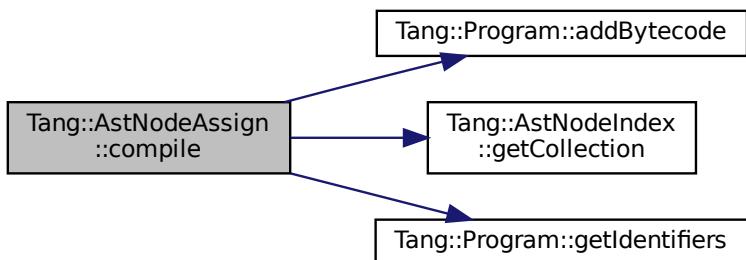
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.3.4.2 compilePreprocess()

```
void AstNodeAssign::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

5.3.4.3 dump()

```
string AstNodeAssign::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

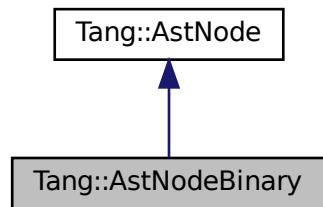
- [include/astNodeAssign.hpp](#)
- [src/astNodeAssign.cpp](#)

5.4 Tang::AstNodeBinary Class Reference

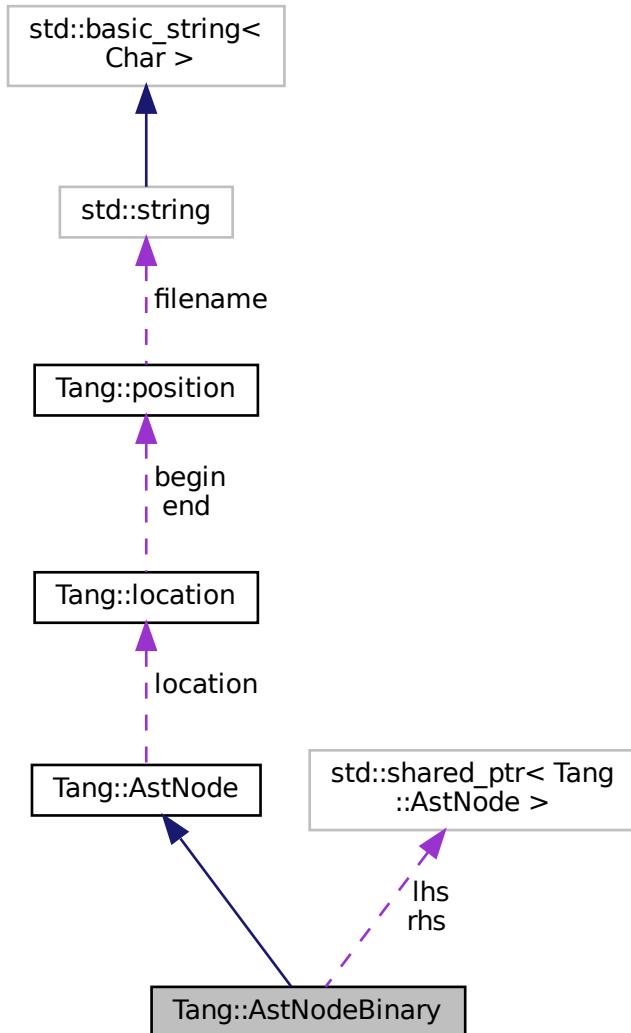
An [AstNode](#) that represents a binary expression.

```
#include <astNodeBinary.hpp>
```

Inheritance diagram for Tang::AstNodeBinary:



Collaboration diagram for Tang::AstNodeBinary:



Public Types

- enum `Operation` {
 `Add` , `Subtract` , `Multiply` , `Divide` ,
 `Modulo` , `LessThan` , `LessThanEqual` , `GreaterThan` ,
 `GreaterThanOrEqualTo` , `Equal` , `NotEqual` , `And` ,
 `Or` }

Indicates the type of binary expression that this node represents.
 - enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodeBinary (Operation op, std::shared_ptr< AstNode > lhs, std::shared_ptr< AstNode > rhs, Tang::location location)`
The constructor.
- `virtual std::string dump (std::string indent="") const override`
Return a string that describes the contents of the node.
- `virtual void compile (Tang::Program &program) const override`
Compile the ast of the provided Tang::Program.
- `virtual void compilePreprocess (Program &program, PreprocessState state) const override`
Run any preprocess analysis needed before compilation.

Public Attributes

- `Tang::location location`
The location associated with this node.

Private Attributes

- `Operation op`
The binary operation performed.
- `std::shared_ptr< AstNode > lhs`
The left hand side expression.
- `std::shared_ptr< AstNode > rhs`
The right hand side expression.

5.4.1 Detailed Description

An `AstNode` that represents a binary expression.

5.4.2 Member Enumeration Documentation

5.4.2.1 Operation

```
enum Tang::AstNodeBinary::Operation
```

Indicates the type of binary expression that this node represents.

Enumerator

Add	Indicates lhs + rhs.
Subtract	Indicates lhs - rhs.
Multiply	Indicates lhs * rhs.
Divide	Indicates lhs / rhs.
Modulo	Indicates lhs % rhs.
LessThan	Indicates lhs < rhs.
LessThanEqual	Indicates lhs <= rhs.
GreaterThan	Indicates lhs > rhs.
GreaterThanEqual	Indicates lhs >= rhs.
Equal	Indicates lhs == rhs.

5.4.2.2 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	AstNode is part of an assignment expression.

5.4.3 Constructor & Destructor Documentation

5.4.3.1 AstNodeBinary()

```
AstNodeBinary::AstNodeBinary (
    Operation op,
    std::shared_ptr< AstNode > lhs,
    std::shared_ptr< AstNode > rhs,
    Tang::location location )
```

The constructor.

Parameters

<i>op</i>	The Tang::AstNodeBinary::Operation to perform.
<i>lhs</i>	The left hand side expression.
<i>rhs</i>	The right hand side expression.
<i>location</i>	The location associated with the expression.

5.4.4 Member Function Documentation

5.4.4.1 compile()

```
void AstNodeBinary::compile (
    Tang::Program & program ) const [override], [virtual]
```

Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

5.4.4.2 compilePreprocess()

```
void AstNodeBinary::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

5.4.4.3 dump()

```
string AstNodeBinary::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

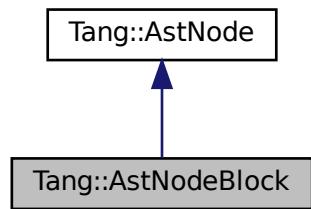
- [include/astNodeBinary.hpp](#)
- [src/astNodeBinary.cpp](#)

5.5 Tang::AstNodeBlock Class Reference

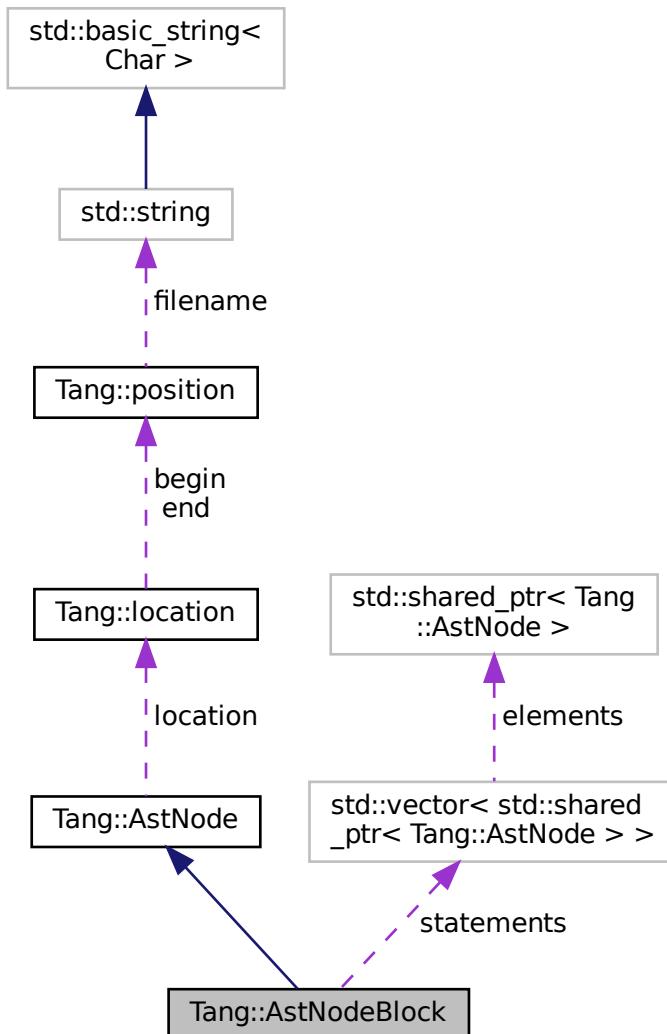
An [AstNode](#) that represents a code block.

```
#include <astNodeBlock.hpp>
```

Inheritance diagram for Tang::AstNodeBlock:



Collaboration diagram for Tang::AstNodeBlock:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodeBlock` (const `std::vector<std::shared_ptr<AstNode>>` &`statements`, `Tang::location` `location`)
The constructor.
- virtual `std::string` `dump` (`std::string` `indent=""`) const override
Return a string that describes the contents of the node.
- virtual void `compile` (`Tang::Program` &`program`) const override

Compile the ast of the provided [Tang::Program](#).

- virtual void [compilePreprocess](#) ([Program](#) &program, [PreprocessState](#) state) const override
Run any preprocess analysis needed before compilation.

Public Attributes

- [Tang::location](#) location
The location associated with this node.

Private Attributes

- std::vector< std::shared_ptr< [AstNode](#) > > statements
The statements included in the code block.

5.5.1 Detailed Description

An [AstNode](#) that represents a code block.

5.5.2 Member Enumeration Documentation

5.5.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	AstNode is part of an assignment expression.

5.5.3 Constructor & Destructor Documentation

5.5.3.1 AstNodeBlock()

```
AstNodeBlock::AstNodeBlock (
    const std::vector< std::shared_ptr< AstNode >> & statements,
    Tang::location location )
```

The constructor.

Parameters

<i>statements</i>	The statements of the code block.
<i>location</i>	The location associated with the expression.

5.5.4 Member Function Documentation**5.5.4.1 compile()**

```
void AstNodeBlock::compile (
    Tang::Program & program ) const [override], [virtual]
```

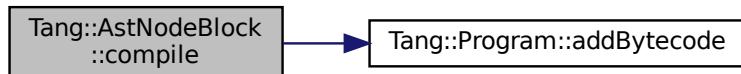
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:

**5.5.4.2 compilePreprocess()**

```
void AstNodeBlock::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

5.5.4.3 dump()

```
string AstNodeBlock::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

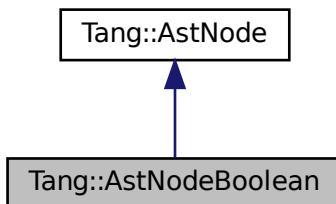
- [include/astNodeBlock.hpp](#)
- [src/astNodeBlock.cpp](#)

5.6 Tang::AstNodeBoolean Class Reference

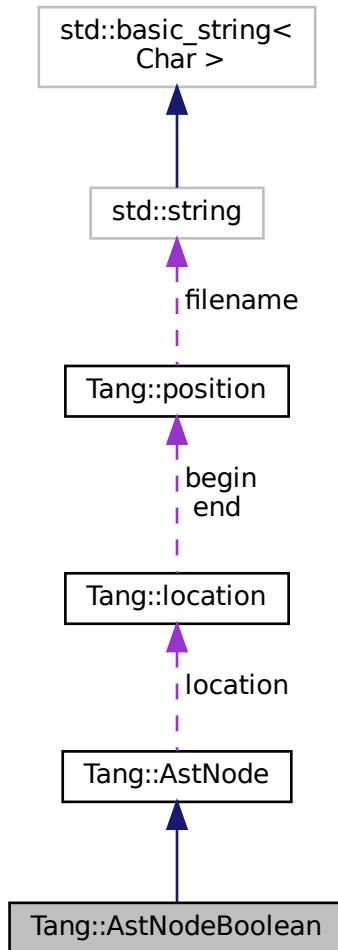
An [AstNode](#) that represents a boolean literal.

```
#include <astNodeBoolean.hpp>
```

Inheritance diagram for Tang::AstNodeBoolean:



Collaboration diagram for Tang::AstNodeBoolean:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodeBoolean (bool val, Tang::location location)`
The constructor.
- `virtual std::string dump (std::string indent="") const override`
Return a string that describes the contents of the node.
- `virtual void compile (Tang::Program &program) const override`
Compile the ast of the provided Tang::Program.
- `virtual void compilePreprocess (Program &program, PreprocessState state) const`
Run any preprocess analysis needed before compilation.

Public Attributes

- [Tang::location location](#)
The location associated with this node.

Private Attributes

- bool [val](#)
The boolean value being stored.

5.6.1 Detailed Description

An [AstNode](#) that represents a boolean literal.

5.6.2 Member Enumeration Documentation

5.6.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	AstNode is part of an assignment expression.

5.6.3 Constructor & Destructor Documentation

5.6.3.1 AstNodeBoolean()

```
AstNodeBoolean::AstNodeBoolean (
    bool val,
    Tang::location location )
```

The constructor.

Parameters

val	The boolean to represent.
location	The location associated with the expression.

5.6.4 Member Function Documentation

5.6.4.1 compile()

```
void AstNodeBoolean::compile (
    Tang::Program & program ) const [override], [virtual]
```

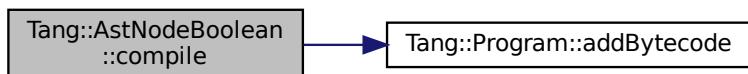
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.6.4.2 compilePreprocess()

```
void AstNode::compilePreprocess (
    Program & program,
    PreprocessState state ) const [virtual], [inherited]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented in [Tang::AstNodeWhile](#), [Tang::AstNodeUse](#), [Tang::AstNodeUnary](#), [Tang::AstNodeTernary](#), [Tang::AstNodeString](#), [Tang::AstNodeSlice](#), [Tang::AstNodeReturn](#), [Tang::AstNodeRangedFor](#), [Tang::AstNodePrint](#), [Tang::AstNodePeriod](#), [Tang::AstNodeMap](#), [Tang::AstNodeLibrary](#), [Tang::AstNodeIndex](#), [Tang::AstNodeIfElse](#), [Tang::AstNodeIdentifier](#), [Tang::AstNodeFunctionDeclaration](#), [Tang::AstNodeFunctionCall](#), [Tang::AstNodeFor](#), [Tang::AstNodeDoWhile](#), [Tang::AstNodeCast](#), [Tang::AstNodeBlock](#), [Tang::AstNodeBinary](#), [Tang::AstNodeAssign](#), and [Tang::AstNodeArray](#).

5.6.4.3 dump()

```
string AstNodeBoolean::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

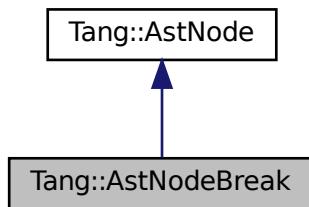
- [include/astNodeBoolean.hpp](#)
- [src/astNodeBoolean.cpp](#)

5.7 Tang::AstNodeBreak Class Reference

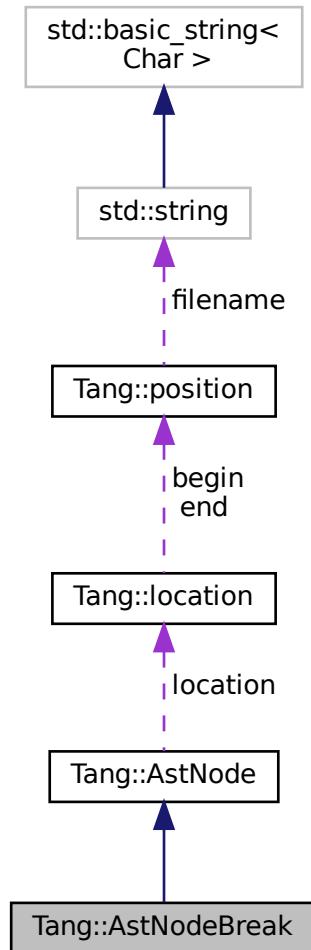
An [AstNode](#) that represents a `break` statement.

```
#include <astNodeBreak.hpp>
```

Inheritance diagram for Tang::AstNodeBreak:



Collaboration diagram for Tang::AstNodeBreak:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodeBreak (Tang::location location)`
The constructor.
- `virtual std::string dump (std::string indent="") const override`
Return a string that describes the contents of the node.
- `virtual void compile (Tang::Program &program) const override`
Compile the ast of the provided `Tang::Program`.
- `virtual void compilePreprocess (Program &program, PreprocessState state) const`
Run any preprocess analysis needed before compilation.

Public Attributes

- `Tang::location location`
The location associated with this node.

5.7.1 Detailed Description

An `AstNode` that represents a `break` statement.

5.7.2 Member Enumeration Documentation

5.7.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	<code>AstNode</code> is part of an assignment expression.

5.7.3 Constructor & Destructor Documentation

5.7.3.1 AstNodeBreak()

```
AstNodeBreak::AstNodeBreak (
    Tang::location location )
```

The constructor.

Parameters

<code>location</code>	The location associated with the expression.
-----------------------	--

5.7.4 Member Function Documentation

5.7.4.1 compile()

```
void AstNodeBreak::compile (
    Tang::Program & program ) const [override], [virtual]
```

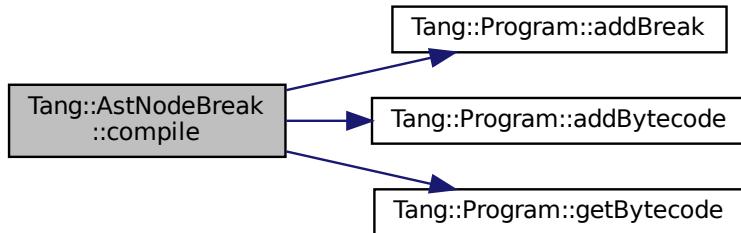
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.7.4.2 compilePreprocess()

```
void AstNode::compilePreprocess (
    Program & program,
    PreprocessState state ) const [virtual], [inherited]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented in [Tang::AstNodeWhile](#), [Tang::AstNodeUse](#), [Tang::AstNodeUnary](#), [Tang::AstNodeTernary](#), [Tang::AstNodeString](#), [Tang::AstNodeSlice](#), [Tang::AstNodeReturn](#), [Tang::AstNodeRangedFor](#), [Tang::AstNodePrint](#), [Tang::AstNodePeriod](#), [Tang::AstNodeMap](#), [Tang::AstNodeLibrary](#), [Tang::AstNodeIndex](#), [Tang::AstNodeIfElse](#), [Tang::AstNodeIdentifier](#), [Tang::AstNodeFunctionDeclaration](#), [Tang::AstNodeFunctionCall](#), [Tang::AstNodeFor](#), [Tang::AstNodeDoWhile](#), [Tang::AstNodeCast](#), [Tang::AstNodeBlock](#), [Tang::AstNodeBinary](#), [Tang::AstNodeAssign](#), and [Tang::AstNodeArray](#).

5.7.4.3 dump()

```
string AstNodeBreak::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

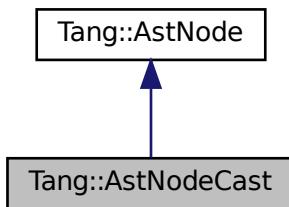
- [include/astNodeBreak.hpp](#)
- [src/astNodeBreak.cpp](#)

5.8 Tang::AstNodeCast Class Reference

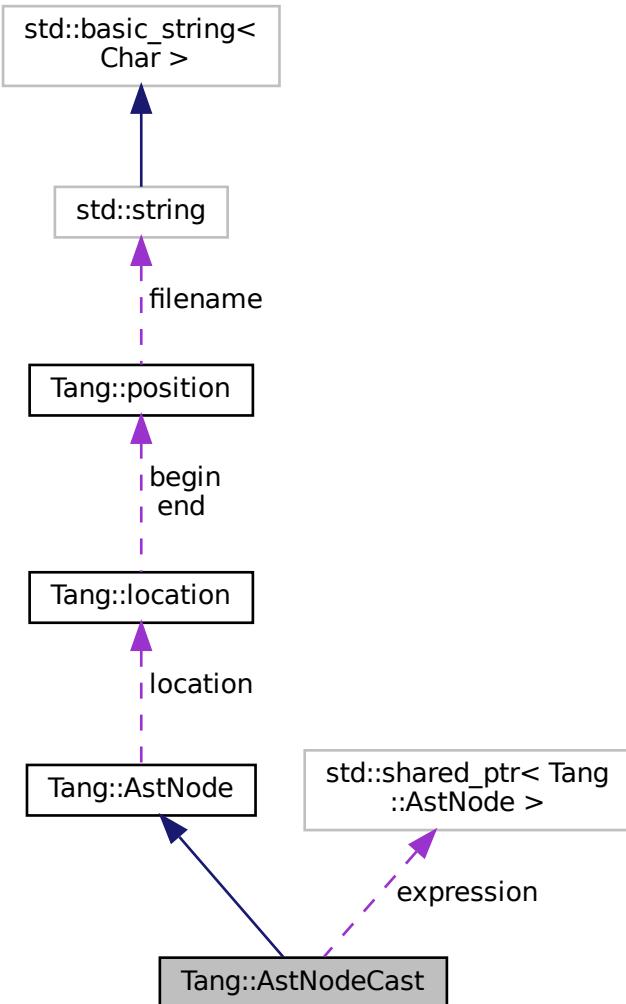
An [AstNode](#) that represents a typecast of an expression.

```
#include <astNodeCast.hpp>
```

Inheritance diagram for Tang::AstNodeCast:



Collaboration diagram for Tang::AstNodeCast:



Public Types

- enum `Type` { `Integer` , `Float` , `Boolean` , `String` }
The possible types that can be cast to.
- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Public Member Functions

- `AstNodeCast (Type targetType, std::shared_ptr< AstNode > expression, Tang::location location)`
The constructor.
- `virtual std::string dump (std::string indent="") const override`

Return a string that describes the contents of the node.

- virtual void `compile (Tang::Program &program)` const override
Compile the ast of the provided Tang::Program.
- virtual void `compilePreprocess (Program &program, PreprocessState state)` const override
Run any preprocess analysis needed before compilation.

Public Attributes

- `Tang::location location`
The location associated with this node.

Private Attributes

- `Type targetType`
The target type.
- `std::shared_ptr< AstNode > expression`
The expression being typecast.

5.8.1 Detailed Description

An `AstNode` that represents a typecast of an expression.

5.8.2 Member Enumeration Documentation

5.8.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	<code>AstNode</code> is part of an assignment expression.

5.8.2.2 Type

```
enum Tang::AstNodeCast::Type
```

The possible types that can be cast to.

Enumerator

Integer	Cast to a Tang::ComputedExpressionInteger .
Float	Cast to a Tang::ComputedExpressionFloat .
Boolean	Cast to a Tang::ComputedExpressionBoolean .
String	Cast to a Tang::ComputedExpressionString .

5.8.3 Constructor & Destructor Documentation**5.8.3.1 AstNodeCast()**

```
AstNodeCast::AstNodeCast (
    Type targetType,
    std::shared_ptr< AstNode > expression,
    Tang::location location )
```

The constructor.

Parameters

<i>targetType</i>	The target type that the expression will be cast to.
<i>expression</i>	The expression to be typecast.
<i>location</i>	The location associated with this node.

5.8.4 Member Function Documentation**5.8.4.1 compile()**

```
void AstNodeCast::compile (
    Tang::Program & program ) const [override], [virtual]
```

Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

5.8.4.2 compilePreprocess()

```
void AstNodeCast::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

5.8.4.3 dump()

```
string AstNodeCast::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

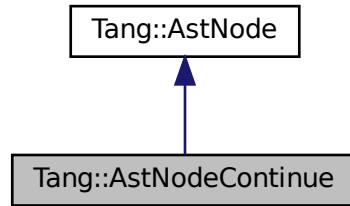
- include/astNodeCast.hpp
- src/astNodeCast.cpp

5.9 Tang::AstNodeContinue Class Reference

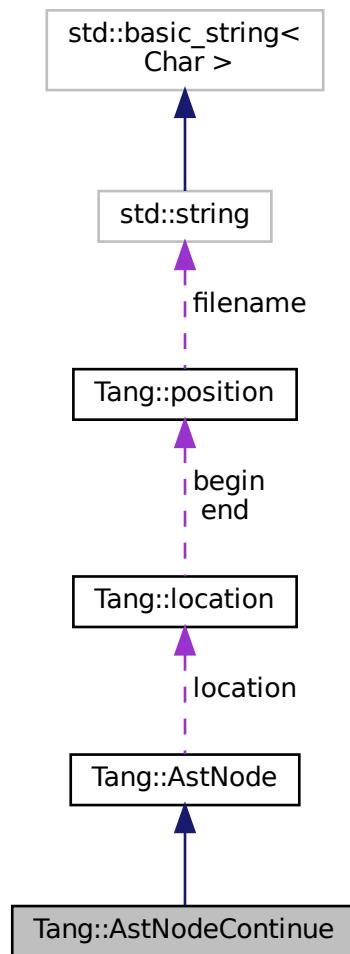
An [AstNode](#) that represents a `continue` statement.

```
#include <astNodeContinue.hpp>
```

Inheritance diagram for Tang::AstNodeContinue:



Collaboration diagram for Tang::AstNodeContinue:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodeContinue (Tang::location location)`
The constructor.
- `virtual std::string dump (std::string indent="") const override`
Return a string that describes the contents of the node.
- `virtual void compile (Tang::Program &program) const override`
Compile the ast of the provided `Tang::Program`.
- `virtual void compilePreprocess (Program &program, PreprocessState state) const`
Run any preprocess analysis needed before compilation.

Public Attributes

- `Tang::location location`
The location associated with this node.

5.9.1 Detailed Description

An `AstNode` that represents a `continue` statement.

5.9.2 Member Enumeration Documentation

5.9.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

<code>Default</code>	The default state.
<code>IsAssignment</code>	<code>AstNode</code> is part of an assignment expression.

5.9.3 Constructor & Destructor Documentation

5.9.3.1 AstNodeContinue()

```
AstNodeContinue::AstNodeContinue (
    Tang::location location )
```

The constructor.

Parameters

<i>location</i>	The location associated with the expression.
-----------------	--

5.9.4 Member Function Documentation

5.9.4.1 compile()

```
void AstNodeContinue::compile (
    Tang::Program & program ) const [override], [virtual]
```

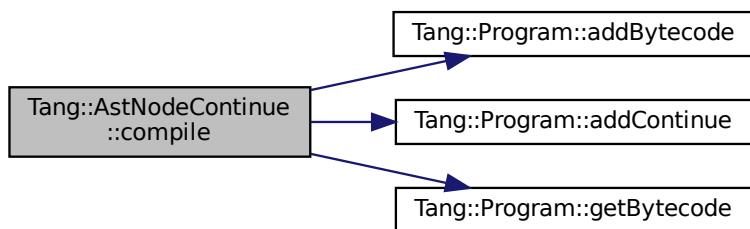
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.9.4.2 compilePreprocess()

```
void AstNode::compilePreprocess (
    Program & program,
    PreprocessState state ) const [virtual], [inherited]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented in [Tang::AstNodeWhile](#), [Tang::AstNodeUse](#), [Tang::AstNodeUnary](#), [Tang::AstNodeTernary](#), [Tang::AstNodeString](#), [Tang::AstNodeSlice](#), [Tang::AstNodeReturn](#), [Tang::AstNodeRangedFor](#), [Tang::AstNodePrint](#), [Tang::AstNodePeriod](#), [Tang::AstNodeMap](#), [Tang::AstNodeLibrary](#), [Tang::AstNodeIndex](#), [Tang::AstNodeIfElse](#), [Tang::AstNodeIdentifier](#), [Tang::AstNodeFunctionDeclaration](#), [Tang::AstNodeFunctionCall](#), [Tang::AstNodeFor](#), [Tang::AstNodeDoWhile](#), [Tang::AstNodeCast](#), [Tang::AstNodeBlock](#), [Tang::AstNodeBinary](#), [Tang::AstNodeAssign](#), and [Tang::AstNodeArray](#).

5.9.4.3 dump()

```
string AstNodeContinue::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

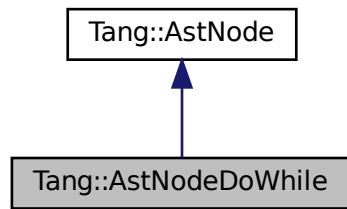
- [include/astNodeContinue.hpp](#)
- [src/astNodeContinue.cpp](#)

5.10 Tang::AstNodeDoWhile Class Reference

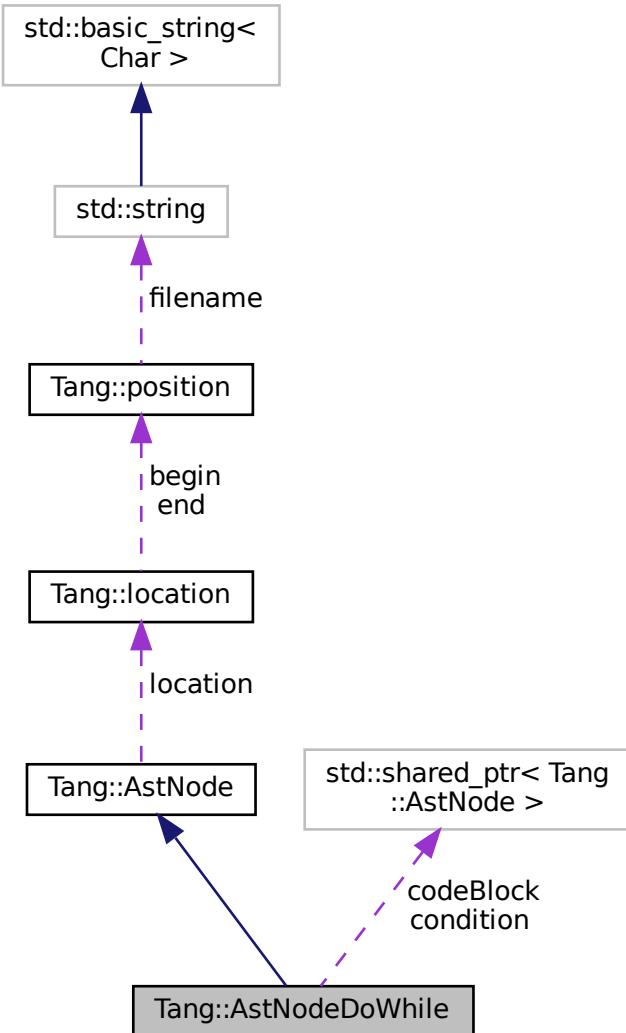
An [AstNode](#) that represents a do..while statement.

```
#include <astNodeDoWhile.hpp>
```

Inheritance diagram for Tang::AstNodeDoWhile:



Collaboration diagram for Tang::AstNodeDoWhile:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Public Member Functions

- `AstNodeDoWhile (std::shared_ptr< AstNode > condition, std::shared_ptr< AstNode > codeBlock, Tang::location location)`
The constructor.
- `virtual std::string dump (std::string indent="") const override`
Return a string that describes the contents of the node.

- virtual void `compile (Tang::Program &program)` const override
Compile the ast of the provided Tang::Program.
- virtual void `compilePreprocess (Program &program, PreprocessState state)` const override
Run any preprocess analysis needed before compilation.

Public Attributes

- `Tang::location location`
The location associated with this node.

Private Attributes

- `std::shared_ptr< AstNode > condition`
The expression which determines whether or not the code block will continue to be executed.
- `std::shared_ptr< AstNode > codeBlock`
The code block executed when the condition is true.

5.10.1 Detailed Description

An `AstNode` that represents a do..while statement.

5.10.2 Member Enumeration Documentation

5.10.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	<code>AstNode</code> is part of an assignment expression.

5.10.3 Constructor & Destructor Documentation

5.10.3.1 AstNodeDoWhile()

```
AstNodeDoWhile::AstNodeDoWhile (
    std::shared_ptr< AstNode > condition,
```

```
std::shared_ptr< AstNode > codeBlock,
Tang::location location )
```

The constructor.

Parameters

<i>condition</i>	The expression which determines whether the thenBlock or elseBlock is executed.
<i>codeBlock</i>	The statement executed when the condition is true.
<i>location</i>	The location associated with the expression.

5.10.4 Member Function Documentation

5.10.4.1 compile()

```
void AstNodeDoWhile::compile (
    Tang::Program & program ) const [override], [virtual]
```

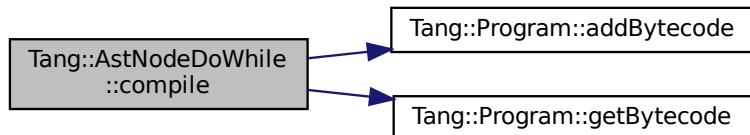
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.10.4.2 compilePreprocess()

```
void AstNodeDoWhile::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

5.10.4.3 dump()

```
string AstNodeDoWhile::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

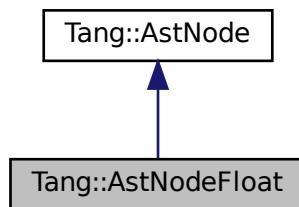
- include/astNodeDoWhile.hpp
- src/astNodeDoWhile.cpp

5.11 Tang::AstNodeFloat Class Reference

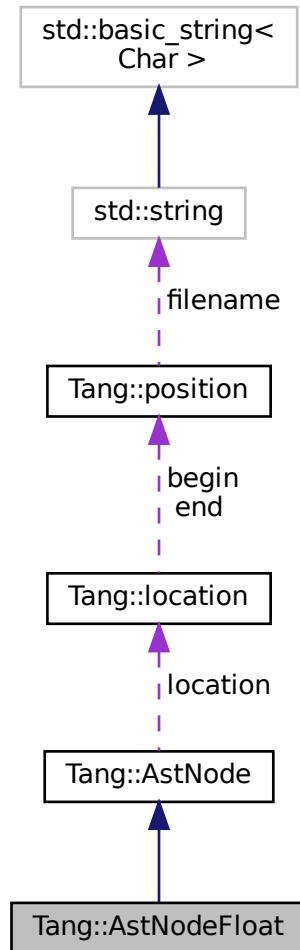
An [AstNode](#) that represents an float literal.

```
#include <astNodeFloat.hpp>
```

Inheritance diagram for Tang::AstNodeFloat:



Collaboration diagram for Tang::AstNodeFloat:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodeFloat (Tang::float_t number, Tang::location location)`
The constructor.
- `virtual std::string dump (std::string indent="") const override`
Return a string that describes the contents of the node.
- `virtual void compile (Tang::Program &program) const override`
Compile the ast of the provided Tang::Program.
- `virtual void compilePreprocess (Program &program, PreprocessState state) const`
Run any preprocess analysis needed before compilation.

Public Attributes

- `Tang::location location`
The location associated with this node.

Private Attributes

- `Tang::float_t val`
The float value being stored.

5.11.1 Detailed Description

An [AstNode](#) that represents an float literal.

Integers are represented by the `Tang::float_t` type, and so are limited in range by that of the underlying type.

5.11.2 Member Enumeration Documentation

5.11.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	AstNode is part of an assignment expression.

5.11.3 Constructor & Destructor Documentation

5.11.3.1 AstNodeFloat()

```
AstNodeFloat::AstNodeFloat (
    Tang::float_t number,
    Tang::location location )
```

The constructor.

Parameters

<i>number</i>	The number to represent.
<i>location</i>	The location associated with the expression.

5.11.4 Member Function Documentation**5.11.4.1 compile()**

```
void AstNodeFloat::compile (
    Tang::Program & program ) const [override], [virtual]
```

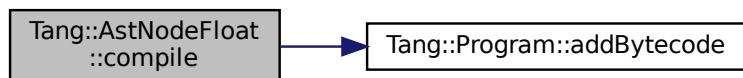
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:

**5.11.4.2 compilePreprocess()**

```
void AstNode::compilePreprocess (
    Program & program,
    PreprocessState state ) const [virtual], [inherited]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented in [Tang::AstNodeWhile](#), [Tang::AstNodeUse](#), [Tang::AstNodeUnary](#), [Tang::AstNodeTernary](#), [Tang::AstNodeString](#), [Tang::AstNodeSlice](#), [Tang::AstNodeReturn](#), [Tang::AstNodeRangedFor](#), [Tang::AstNodePrint](#), [Tang::AstNodePeriod](#), [Tang::AstNodeMap](#), [Tang::AstNodeLibrary](#), [Tang::AstNodeIndex](#), [Tang::AstNodeIfElse](#), [Tang::AstNodeIdentifier](#), [Tang::AstNodeFunctionDeclaration](#), [Tang::AstNodeFunctionCall](#), [Tang::AstNodeFor](#), [Tang::AstNodeDoWhile](#), [Tang::AstNodeCast](#), [Tang::AstNodeBlock](#), [Tang::AstNodeBinary](#), [Tang::AstNodeAssign](#), and [Tang::AstNodeArray](#).

5.11.4.3 `dump()`

```
string AstNodeFloat::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

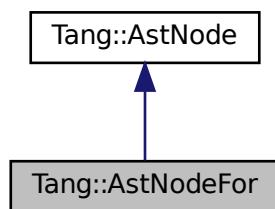
- [include/astNodeFloat.hpp](#)
- [src/astNodeFloat.cpp](#)

5.12 Tang::AstNodeFor Class Reference

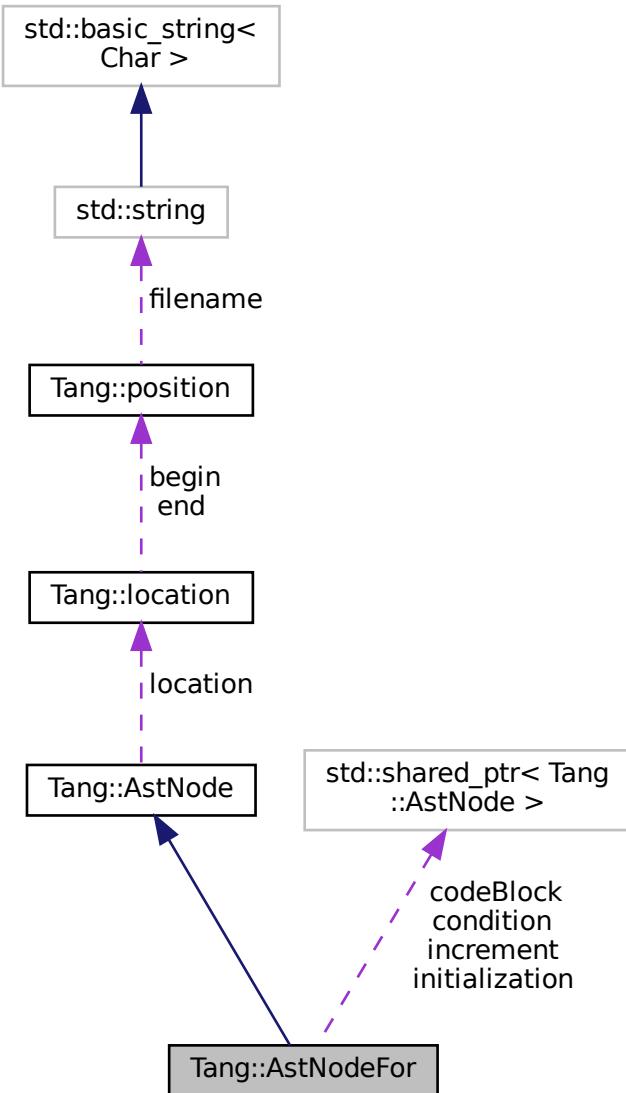
An [AstNode](#) that represents an if() statement.

```
#include <astNodeFor.hpp>
```

Inheritance diagram for Tang::AstNodeFor:



Collaboration diagram for Tang::AstNodeFor:



Public Types

- enum **PreprocessState** : int { **Default** = 0 , **IsAssignment** = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- AstNodeFor** (`std::shared_ptr<AstNode> initialization, std::shared_ptr<AstNode> condition, std::shared_ptr<AstNode> increment, std::shared_ptr<AstNode> codeBlock, Tang::location location)`)
The constructor.

- virtual std::string `dump` (std::string `indent=""`) const override
Return a string that describes the contents of the node.
- virtual void `compile` (`Tang::Program` &`program`) const override
Compile the ast of the provided `Tang::Program`.
- virtual void `compilePreprocess` (`Program` &`program`, `PreprocessState` `state`) const override
Run any preprocess analysis needed before compilation.

Public Attributes

- `Tang::location location`
The location associated with this node.

Private Attributes

- `std::shared_ptr< AstNode > initialization`
The expression to be executed first to set up the for() loop.
- `std::shared_ptr< AstNode > condition`
The expression which determines whether or not the code block will continue to be executed.
- `std::shared_ptr< AstNode > increment`
The expression to be executed immediately after the code block.
- `std::shared_ptr< AstNode > codeBlock`
The code block executed when the condition is true.

5.12.1 Detailed Description

An `AstNode` that represents an if() statement.

5.12.2 Member Enumeration Documentation

5.12.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

<code>Default</code>	The default state.
<code>IsAssignment</code>	<code>AstNode</code> is part of an assignment expression.

5.12.3 Constructor & Destructor Documentation

5.12.3.1 AstNodeFor()

```
AstNodeFor::AstNodeFor (
    std::shared_ptr< AstNode > initialization,
    std::shared_ptr< AstNode > condition,
    std::shared_ptr< AstNode > increment,
    std::shared_ptr< AstNode > codeBlock,
    Tang::location location )
```

The constructor.

Parameters

<i>initialization</i>	The expression to be executed first.
<i>condition</i>	The expression which determines whether the codeBlock is executed.
<i>increment</i>	The expression to be executed after each codeBlock.
<i>codeBlock</i>	The statement executed when the condition is true.
<i>location</i>	The location associated with the expression.

5.12.4 Member Function Documentation

5.12.4.1 compile()

```
void AstNodeFor::compile (
    Tang::Program & program ) const [override], [virtual]
```

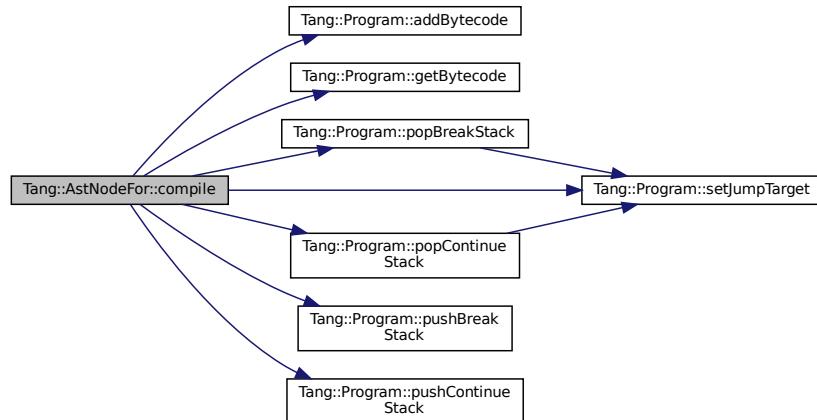
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.12.4.2 compilePreprocess()

```
void AstNodeFor::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

5.12.4.3 dump()

```
string AstNodeFor::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

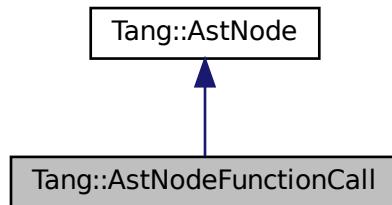
- [include/astNodeFor.hpp](#)
- [src/astNodeFor.cpp](#)

5.13 Tang::AstNodeFunctionCall Class Reference

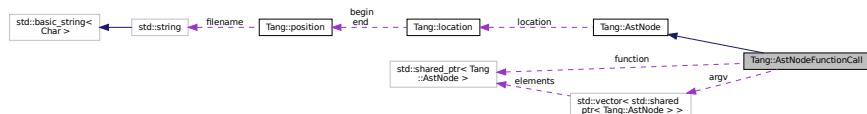
An [AstNode](#) that represents a function call.

```
#include <astNodeFunctionCall.hpp>
```

Inheritance diagram for Tang::AstNodeFunctionCall:



Collaboration diagram for Tang::AstNodeFunctionCall:



Public Types

- enum [PreprocessState](#) : int { [Default](#) = 0 , [IsAssignment](#) = 1 }

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Public Member Functions

- `AstNodeFunctionCall` (`std::shared_ptr< AstNode > function, std::vector< std::shared_ptr< AstNode > > argv, Tang::location location)`
The constructor.
- `virtual std::string dump (std::string indent="") const override`
Return a string that describes the contents of the node.
- `virtual void compile (Tang::Program &program) const override`
Compile the ast of the provided Tang::Program.
- `virtual void compilePreprocess (Program &program, PreprocessState state) const override`
Run any preprocess analysis needed before compilation.

Public Attributes

- `Tang::location location`
The location associated with this node.

Private Attributes

- `std::shared_ptr< AstNode > function`
The function being invoked.
- `std::vector< std::shared_ptr< AstNode > > argv`
The list of arguments provided to the function.

5.13.1 Detailed Description

An `AstNode` that represents a function call.

5.13.2 Member Enumeration Documentation

5.13.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	<code>AstNode</code> is part of an assignment expression.

5.13.3 Constructor & Destructor Documentation

5.13.3.1 AstNodeFunctionCall()

```
AstNodeFunctionCall::AstNodeFunctionCall (
    std::shared_ptr< AstNode > function,
    std::vector< std::shared_ptr< AstNode >> argv,
    Tang::location location )
```

The constructor.

Parameters

<i>function</i>	The function being invoked.
<i>argv</i>	The list of arguments provided to the function.
<i>location</i>	The location associated with the expression.

5.13.4 Member Function Documentation

5.13.4.1 compile()

```
void AstNodeFunctionCall::compile (
    Tang::Program & program ) const [override], [virtual]
```

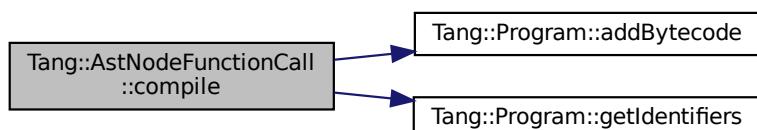
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.13.4.2 compilePreprocess()

```
void AstNodeFunctionCall::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

5.13.4.3 dump()

```
string AstNodeFunctionCall::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

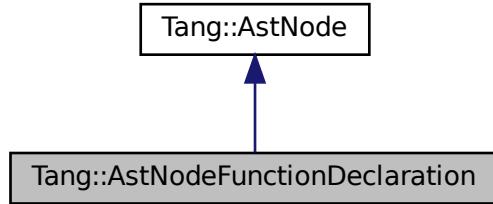
- [include/astNodeFunctionCall.hpp](#)
- [src/astNodeFunctionCall.cpp](#)

5.14 Tang::AstNodeFunctionDeclaration Class Reference

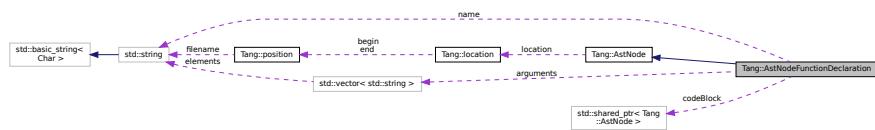
An [AstNode](#) that represents a function declaration.

```
#include <astNodeFunctionDeclaration.hpp>
```

Inheritance diagram for Tang::AstNodeFunctionDeclaration:



Collaboration diagram for Tang::AstNodeFunctionDeclaration:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodeFunctionDeclaration (std::string name, std::vector< std::string > arguments, std::shared_ptr< AstNode > codeBlock, Tang::location location)`
The constructor.
- `virtual std::string dump (std::string indent="") const override`
Return a string that describes the contents of the node.
- `virtual void compile (Tang::Program &program) const override`
Compile the ast of the provided Tang::Program.
- `virtual void compilePreprocess (Program &program, PreprocessState state) const override`
Run any preprocess analysis needed before compilation.

Public Attributes

- `Tang::location location`
The location associated with this node.

Private Attributes

- std::string `name`
The name of the function.
- std::vector< std::string > `arguments`
The arguments expected to be provided.
- std::shared_ptr< AstNode > `codeBlock`
The code block executed when the condition is true.

5.14.1 Detailed Description

An `AstNode` that represents a function declaration.

5.14.2 Member Enumeration Documentation

5.14.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	<code>AstNode</code> is part of an assignment expression.

5.14.3 Constructor & Destructor Documentation

5.14.3.1 AstNodeFunctionDeclaration()

```
AstNodeFunctionDeclaration::AstNodeFunctionDeclaration (
    std::string name,
    std::vector< std::string > arguments,
    std::shared_ptr< AstNode > codeBlock,
    Tang::location location )
```

The constructor.

Parameters

<code>name</code>	The name of the function.
<code>arguments</code>	The arguments expected to be provided.
<code>codeBlock</code>	The code executed as part of the function.
<code>location</code>	The location associated with the function declaration.

5.14.4 Member Function Documentation

5.14.4.1 compile()

```
void AstNodeFunctionDeclaration::compile (
    Tang::Program & program ) const [override], [virtual]
```

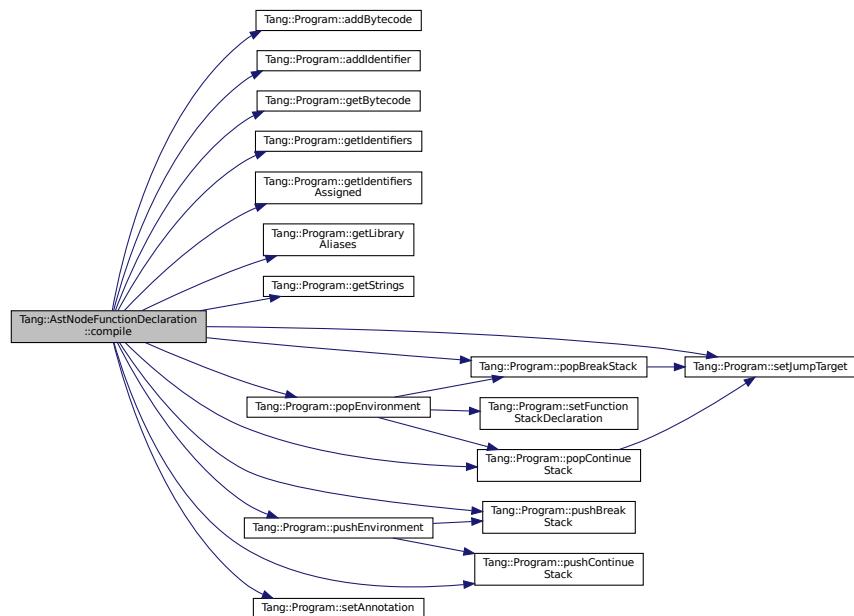
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.14.4.2 compilePreprocess()

```
void AstNodeFunctionDeclaration::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:

**5.14.4.3 dump()**

```
string AstNodeFunctionDeclaration::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

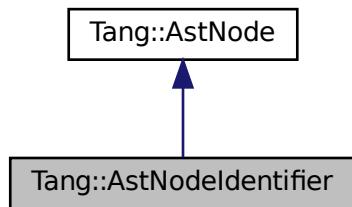
- include/astNodeFunctionDeclaration.hpp
- src/astNodeFunctionDeclaration.cpp

5.15 Tang::AstNodeIdentifier Class Reference

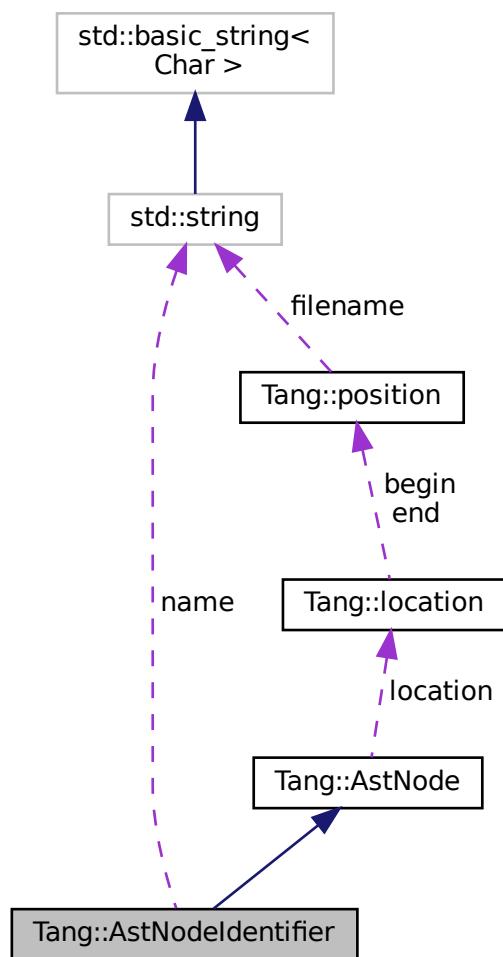
An [AstNode](#) that represents an identifier.

```
#include <astNodeIdentifier.hpp>
```

Inheritance diagram for Tang::AstNodeIdentifier:



Collaboration diagram for Tang::AstNodeIdentifier:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodeIdentifier` (const std::string &`name`, Tang::location `location`)
The constructor.
- virtual std::string `dump` (std::string `indent`= "") const override
Return a string that describes the contents of the node.
- virtual void `compile` (Tang::Program &`program`) const override
Compile the ast of the provided Tang::Program.
- virtual void `compilePreprocess` (Program &`program`, PreprocessState `state`) const override
Run any preprocess analysis needed before compilation.

Public Attributes

- std::string `name`
The name of the identifier.
- Tang::location `location`
The location associated with this node.

5.15.1 Detailed Description

An `AstNode` that represents an identifier.

Identifier names are represented by a string.

5.15.2 Member Enumeration Documentation

5.15.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

<code>Default</code>	The default state.
<code>IsAssignment</code>	<code>AstNode</code> is part of an assignment expression.

5.15.3 Constructor & Destructor Documentation

5.15.3.1 AstNodeIdentifier()

```
AstNodeIdentifier::AstNodeIdentifier (
    const std::string & name,
    Tang::location location )
```

The constructor.

Parameters

<i>name</i>	The name of the identifier
<i>location</i>	The location associated with the expression.

5.15.4 Member Function Documentation

5.15.4.1 compile()

```
void AstNodeIdentifier::compile (
    Tang::Program & program ) const [override], [virtual]
```

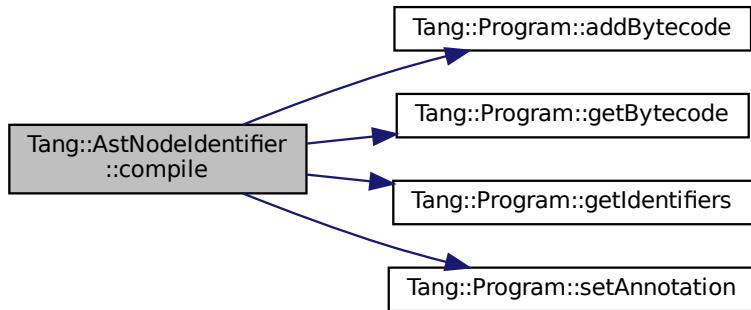
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.15.4.2 compilePreprocess()

```
void AstNodeIdentifier::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

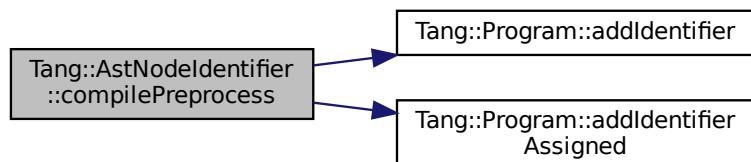
Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.15.4.3 dump()

```
string AstNodeIdentifier::dump (
    std::string indent = "") const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

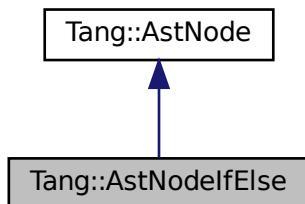
- [include/astNodeIdentifier.hpp](#)
- [src/astNodeIdentifier.cpp](#)

5.16 Tang::AstNodeIfElse Class Reference

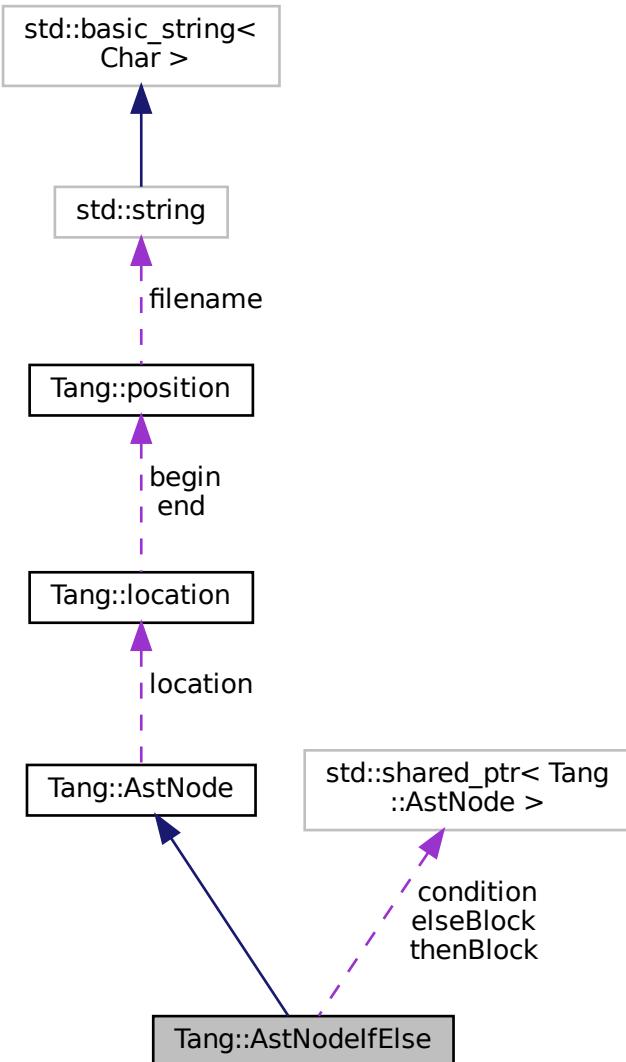
An [AstNode](#) that represents an if..else statement.

```
#include <astNodeIfElse.hpp>
```

Inheritance diagram for Tang::AstNodeIfElse:



Collaboration diagram for Tang::AstNodeIfElse:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodeIfElse` (`std::shared_ptr< AstNode > condition, std::shared_ptr< AstNode > thenBlock, std::shared_ptr< AstNode > elseBlock, Tang::location location)`)
The constructor.

- `AstNodeIfElse` (`std::shared_ptr< AstNode >` `condition`, `std::shared_ptr< AstNode >` `thenBlock`, `Tang::location location`)
The constructor.
- `virtual std::string dump (std::string indent = "") const override`
Return a string that describes the contents of the node.
- `virtual void compile (Tang::Program &program) const override`
Compile the ast of the provided `Tang::Program`.
- `virtual void compilePreprocess (Program &program, PreprocessState state) const override`
Run any preprocess analysis needed before compilation.

Public Attributes

- `Tang::location location`
The location associated with this node.

Private Attributes

- `std::shared_ptr< AstNode > condition`
The expression which determines whether the `thenBlock` or `elseBlock` is executed.
- `std::shared_ptr< AstNode > thenBlock`
The statement executed when the condition is true.
- `std::shared_ptr< AstNode > elseBlock`
The statement executed when the condition is false.

5.16.1 Detailed Description

An `AstNode` that represents an if..else statement.

5.16.2 Member Enumeration Documentation

5.16.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	<code>AstNode</code> is part of an assignment expression.

5.16.3 Constructor & Destructor Documentation

5.16.3.1 AstNodeIfElse() [1/2]

```
AstNodeIfElse::AstNodeIfElse (
    std::shared_ptr< AstNode > condition,
    std::shared_ptr< AstNode > thenBlock,
    std::shared_ptr< AstNode > elseBlock,
    Tang::location location )
```

The constructor.

Parameters

<i>condition</i>	The expression which determines whether the thenBlock or elseBlock is executed.
<i>thenBlock</i>	The statement executed when the condition is true.
<i>elseBlock</i>	The statement executed when the condition is false.
<i>location</i>	The location associated with the expression.

5.16.3.2 AstNodeIfElse() [2/2]

```
AstNodeIfElse::AstNodeIfElse (
    std::shared_ptr< AstNode > condition,
    std::shared_ptr< AstNode > thenBlock,
    Tang::location location )
```

The constructor.

Parameters

<i>condition</i>	The expression which determines whether the thenBlock or elseBlock is executed.
<i>thenBlock</i>	The statement executed when the condition is true.
<i>location</i>	The location associated with the expression.

5.16.4 Member Function Documentation

5.16.4.1 compile()

```
void AstNodeIfElse::compile (
    Tang::Program & program ) const [override], [virtual]
```

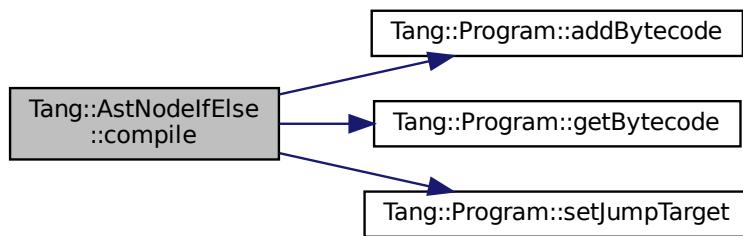
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Tang::Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:

**5.16.4.2 compilePreprocess()**

```
void AstNodeIfElse::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

5.16.4.3 dump()

```
string AstNodeIfElse::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

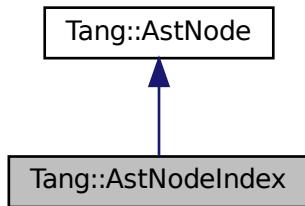
- [include/astNodeIfElse.hpp](#)
- [src/astNodeIfElse.cpp](#)

5.17 Tang::AstNodeIndex Class Reference

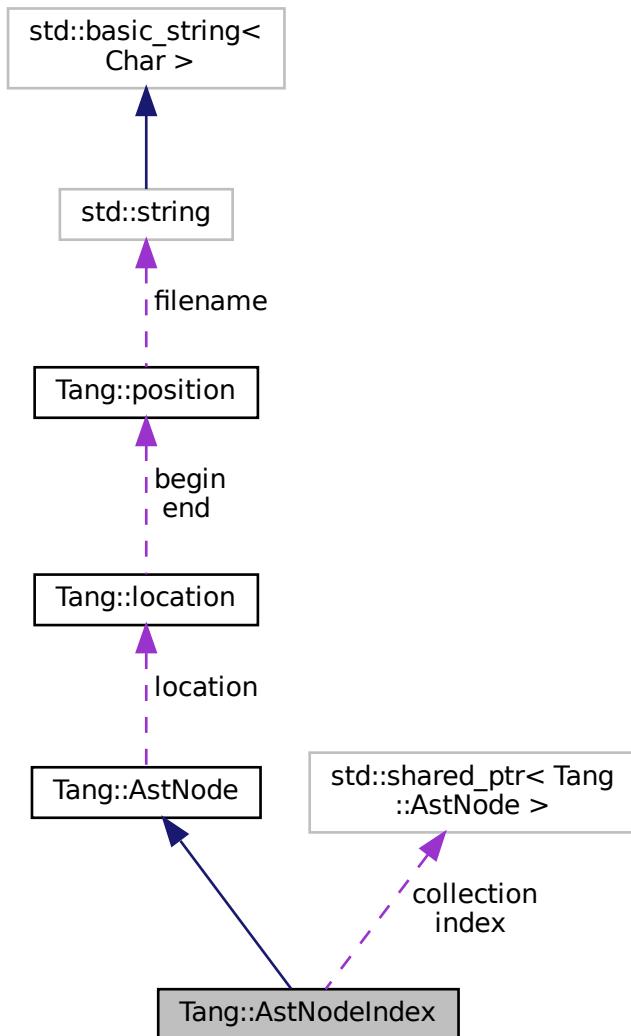
An [AstNode](#) that represents an index into a collection.

```
#include <astNodeIndex.hpp>
```

Inheritance diagram for Tang::AstNodeIndex:



Collaboration diagram for Tang::AstNodeIndex:



Public Types

- enum **PreprocessState** : int { **Default** = 0 , **IsAssignment** = 1 }

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Public Member Functions

- AstNodeIndex** (`std::shared_ptr< AstNode > collection, std::shared_ptr< AstNode > index, Tang::location)`
The constructor.
- virtual std::string dump (std::string indent="") const override**
Return a string that describes the contents of the node.

- virtual void `compile (Tang::Program &program)` const override
Compile the ast of the provided Tang::Program.
- virtual void `compilePreprocess (Program &program, PreprocessState state)` const override
Run any preprocess analysis needed before compilation.
- const std::shared_ptr< const AstNode > `getCollection ()` const
Return a shared pointer to the AstNode serving as the Collection.
- const std::shared_ptr< const AstNode > `getIndex ()` const
Return a shared pointer to the AstNode serving as the Index.

Public Attributes

- `Tang::location location`
The location associated with this node.

Private Attributes

- `std::shared_ptr< AstNode > collection`
The collection into which we will index.
- `std::shared_ptr< AstNode > index`
The index expression.

5.17.1 Detailed Description

An `AstNode` that represents an index into a collection.

5.17.2 Member Enumeration Documentation

5.17.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	<code>AstNode</code> is part of an assignment expression.

5.17.3 Constructor & Destructor Documentation

5.17.3.1 AstNodeIndex()

```
AstNodeIndex::AstNodeIndex (
    std::shared_ptr< AstNode > collection,
    std::shared_ptr< AstNode > index,
    Tang::location location )
```

The constructor.

Parameters

<i>collection</i>	The collection into which we will index.
<i>index</i>	The index expression.
<i>location</i>	The location associated with the expression.

5.17.4 Member Function Documentation

5.17.4.1 compile()

```
void AstNodeIndex::compile (
    Tang::Program & program ) const [override], [virtual]
```

Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

5.17.4.2 compilePreprocess()

```
void AstNodeIndex::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

5.17.4.3 `dump()`

```
string AstNodeIndex::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

5.17.4.4 `getCollection()`

```
const std::shared_ptr< const AstNode > AstNodeIndex::getCollection () const
```

Return a shared pointer to the [AstNode](#) serving as the Collection.

Returns

The collection into which we will index.

5.17.4.5 `getIndex()`

```
const std::shared_ptr< const AstNode > AstNodeIndex::getIndex () const
```

Return a shared pointer to the [AstNode](#) serving as the Index.

Returns

The index expression.

The documentation for this class was generated from the following files:

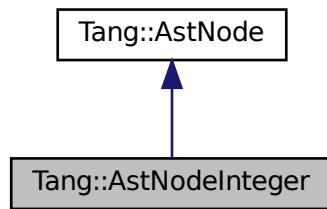
- [include/astNodeIndex.hpp](#)
- [src/astNodeIndex.cpp](#)

5.18 Tang::AstNodeInteger Class Reference

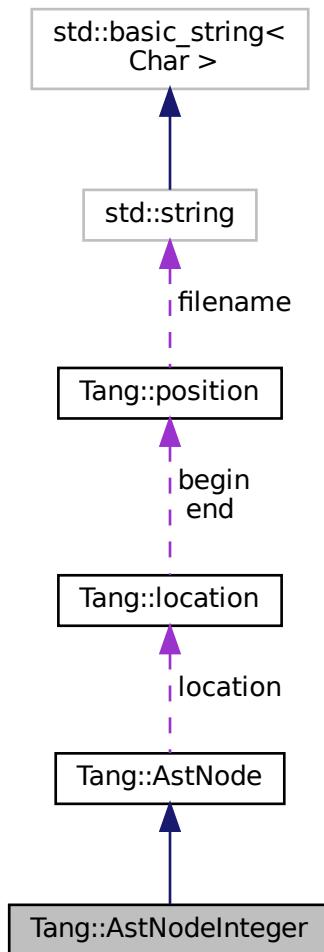
An [AstNode](#) that represents an integer literal.

```
#include <astNodeInteger.hpp>
```

Inheritance diagram for Tang::AstNodeInteger:



Collaboration diagram for Tang::AstNodeInteger:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodeInteger (Tang::integer_t number, Tang::location location)`
The constructor.
- `virtual std::string dump (std::string indent="") const override`
Return a string that describes the contents of the node.
- `virtual void compile (Tang::Program &program) const override`
Compile the ast of the provided Tang::Program.
- `virtual void compilePreprocess (Program &program, PreprocessState state) const`
Run any preprocess analysis needed before compilation.

Public Attributes

- [Tang::location location](#)
The location associated with this node.

Private Attributes

- [Tang::integer_t val](#)
The integer value being stored.

5.18.1 Detailed Description

An [AstNode](#) that represents an integer literal.

Integers are represented by the `Tang::integer_t` type, and so are limited in range by that of the underlying type.

5.18.2 Member Enumeration Documentation

5.18.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	AstNode is part of an assignment expression.

5.18.3 Constructor & Destructor Documentation

5.18.3.1 AstNodeInteger()

```
AstNodeInteger::AstNodeInteger (
    Tang::integer_t number,
    Tang::location location )
```

The constructor.

Parameters

<i>number</i>	The number to represent.
<i>location</i>	The location associated with the expression.

5.18.4 Member Function Documentation**5.18.4.1 compile()**

```
void AstNodeInteger::compile (
    Tang::Program & program ) const [override], [virtual]
```

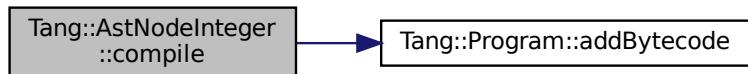
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:

**5.18.4.2 compilePreprocess()**

```
void AstNode::compilePreprocess (
    Program & program,
    PreprocessState state ) const [virtual], [inherited]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented in [Tang::AstNodeWhile](#), [Tang::AstNodeUse](#), [Tang::AstNodeUnary](#), [Tang::AstNodeTernary](#), [Tang::AstNodeString](#), [Tang::AstNodeSlice](#), [Tang::AstNodeReturn](#), [Tang::AstNodeRangedFor](#), [Tang::AstNodePrint](#), [Tang::AstNodePeriod](#), [Tang::AstNodeMap](#), [Tang::AstNodeLibrary](#), [Tang::AstNodeIndex](#), [Tang::AstNodeIfElse](#), [Tang::AstNodeIdentifier](#), [Tang::AstNodeFunctionDeclaration](#), [Tang::AstNodeFunctionCall](#), [Tang::AstNodeFor](#), [Tang::AstNodeDoWhile](#), [Tang::AstNodeCast](#), [Tang::AstNodeBlock](#), [Tang::AstNodeBinary](#), [Tang::AstNodeAssign](#), and [Tang::AstNodeArray](#).

5.18.4.3 dump()

```
string AstNodeInteger::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

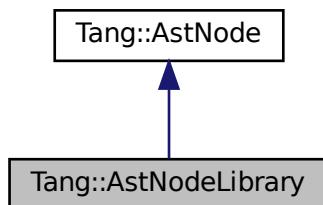
- [include/astNodeInteger.hpp](#)
- [src/astNodeInteger.cpp](#)

5.19 Tang::AstNodeLibrary Class Reference

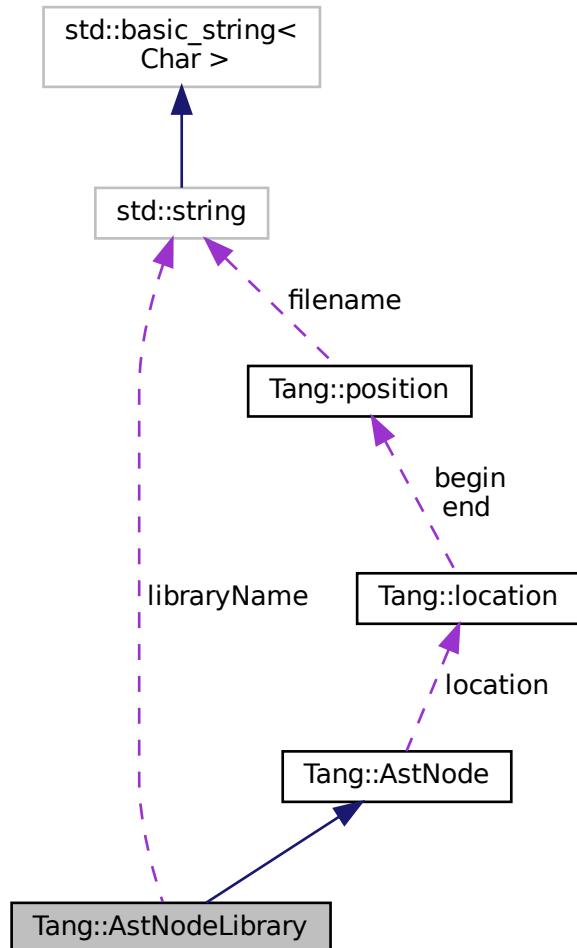
An [AstNode](#) that represents an identifier.

```
#include <astNodeLibrary.hpp>
```

Inheritance diagram for Tang::AstNodeLibrary:



Collaboration diagram for Tang::AstNodeLibrary:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodeLibrary` (const `std::string &libraryName`, `Tang::location location`)
The constructor.
- virtual `std::string dump` (`std::string indent=""`) const override
Return a string that describes the contents of the node.
- virtual void `compile` (`Tang::Program &program`) const override
Compile the ast of the provided `Tang::Program`.
- virtual void `compilePreprocess` (`Program &program`, `PreprocessState state`) const override
Run any preprocess analysis needed before compilation.

Public Attributes

- std::string `libraryName`
The library name.
- `Tang::location location`
The location associated with this node.

5.19.1 Detailed Description

An `AstNode` that represents an identifier.

Library names are represented by a string.

5.19.2 Member Enumeration Documentation

5.19.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	<code>AstNode</code> is part of an assignment expression.

5.19.3 Constructor & Destructor Documentation

5.19.3.1 AstNodeLibrary()

```
AstNodeLibrary::AstNodeLibrary (
    const std::string & libraryName,
    Tang::location location)
```

The constructor.

Parameters

<code>expression</code>	The library expression.
<code>location</code>	The location associated with the expression.

5.19.4 Member Function Documentation

5.19.4.1 compile()

```
void AstNodeLibrary::compile (
    Tang::Program & program ) const [override], [virtual]
```

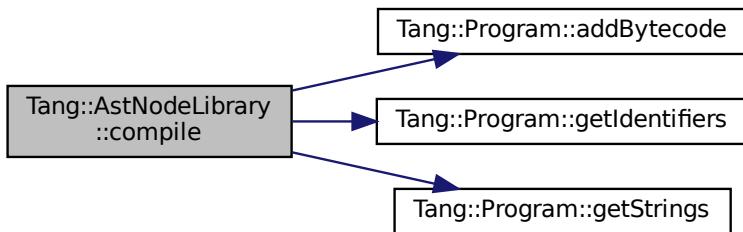
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.19.4.2 compilePreprocess()

```
void AstNodeLibrary::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

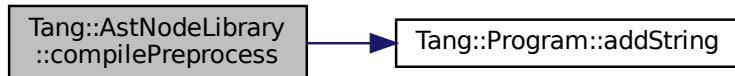
Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.19.4.3 dump()

```
string AstNodeLibrary::dump (\n    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

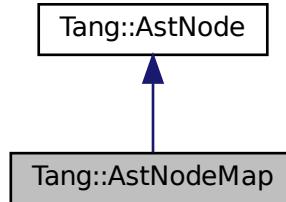
- [include/astNodeLibrary.hpp](#)
- [src/astNodeLibrary.cpp](#)

5.20 Tang::AstNodeMap Class Reference

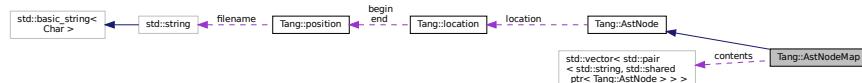
An [AstNode](#) that represents a map literal.

```
#include <astNodeMap.hpp>
```

Inheritance diagram for Tang::AstNodeMap:



Collaboration diagram for Tang::AstNodeMap:



Public Types

- enum [PreprocessState](#) : int { [Default](#) = 0 , [IsAssignment](#) = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- [AstNodeMap](#) ([std::vector< std::pair< std::string, std::shared_ptr< Tang::AstNode >>>](#) [contents](#), [Tang::location](#) [location](#))
The constructor.
- virtual [std::string](#) [dump](#) ([std::string](#) [indent](#)= "") const override
Return a string that describes the contents of the node.
- virtual void [compile](#) ([Tang::Program](#) &[program](#)) const override
Compile the ast of the provided [Tang::Program](#).
- virtual void [compilePreprocess](#) ([Program](#) &[program](#), [PreprocessState](#) [state](#)) const override
Run any preprocess analysis needed before compilation.

Public Attributes

- [Tang::location](#) [location](#)
The location associated with this node.

Private Attributes

- [std::vector< std::pair< std::string, std::shared_ptr< Tang::AstNode >>>](#) [contents](#)
The contents of the array.

5.20.1 Detailed Description

An [AstNode](#) that represents a map literal.

Keys can only be strings.

5.20.2 Member Enumeration Documentation

5.20.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	AstNode is part of an assignment expression.

5.20.3 Constructor & Destructor Documentation

5.20.3.1 AstNodeMap()

```
AstNodeMap::AstNodeMap (
    std::vector< std::pair< std::string, std::shared_ptr< Tang::AstNode >>> contents,
    Tang::location location )
```

The constructor.

Parameters

<i>contents</i>	The contents of the map.
<i>location</i>	The location associated with the expression.

5.20.4 Member Function Documentation

5.20.4.1 compile()

```
void AstNodeMap::compile (
    Tang::Program & program ) const [override], [virtual]
```

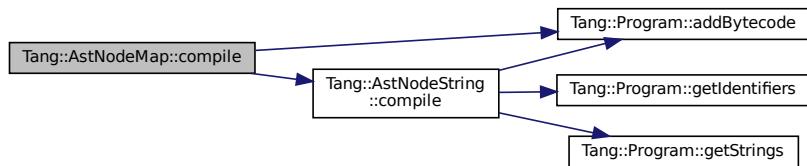
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.20.4.2 compilePreprocess()

```
void AstNodeMap::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.20.4.3 dump()

```
string AstNodeMap::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

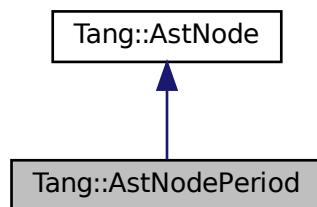
- [include/astNodeMap.hpp](#)
- [src/astNodeMap.cpp](#)

5.21 Tang::AstNodePeriod Class Reference

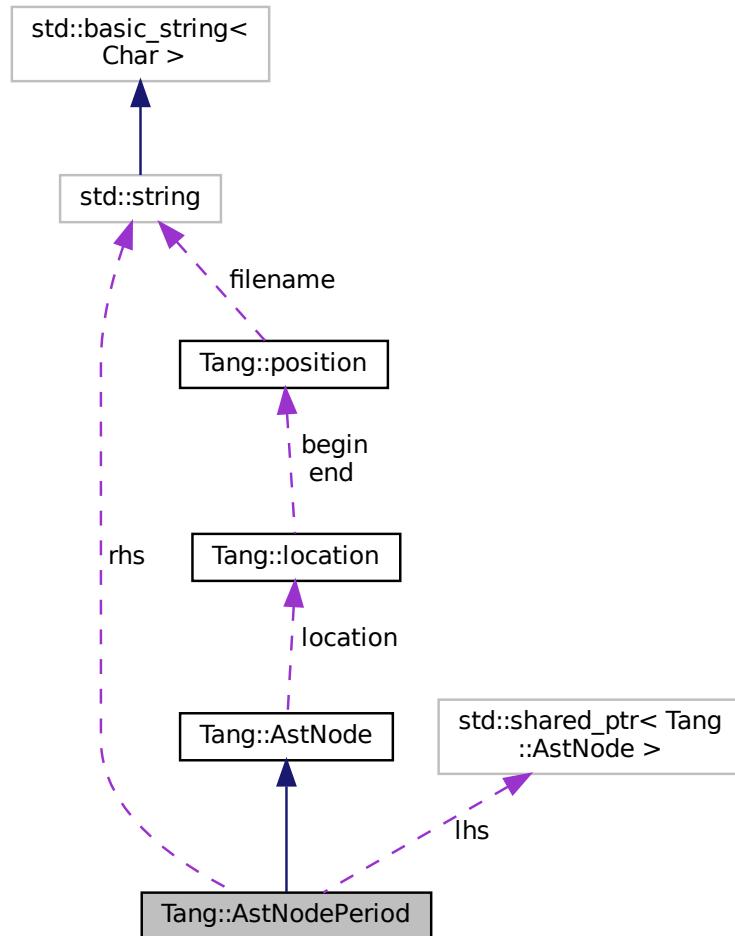
An [AstNode](#) that represents a member access (period) into an object.

```
#include <astNodePeriod.hpp>
```

Inheritance diagram for Tang::AstNodePeriod:



Collaboration diagram for Tang::AstNodePeriod:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodePeriod (std::shared_ptr< AstNode > lhs, std::string rhs, Tang::location location)`
The constructor.
- `virtual std::string dump (std::string indent="") const override`
Return a string that describes the contents of the node.
- `virtual void compile (Tang::Program &program) const override`
Compile the ast of the provided Tang::Program.
- `virtual void compilePreprocess (Program &program, PreprocessState state) const override`
Run any preprocess analysis needed before compilation.

Public Attributes

- [Tang::location location](#)
The location associated with this node.

Private Attributes

- [std::shared_ptr< AstNode > lhs](#)
The lhs into which we will rhs.
- [std::string rhs](#)
The rhs expression.

5.21.1 Detailed Description

An [AstNode](#) that represents a member access (period) into an object.

5.21.2 Member Enumeration Documentation

5.21.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	AstNode is part of an assignment expression.

5.21.3 Constructor & Destructor Documentation

5.21.3.1 AstNodePeriod()

```
AstNodePeriod::AstNodePeriod (
    std::shared_ptr< AstNode > lhs,
    std::string rhs,
    Tang::location location )
```

The constructor.

Parameters

<i>lhs</i>	The lhs on which the member access will be performed
<i>rhs</i>	The rhs identifier.
<i>location</i>	The location associated with the expression.

5.21.4 Member Function Documentation**5.21.4.1 compile()**

```
void AstNodePeriod::compile (
    Tang::Program & program ) const [override], [virtual]
```

Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

5.21.4.2 compilePreprocess()

```
void AstNodePeriod::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

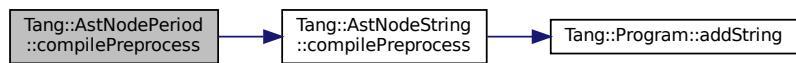
Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.21.4.3 dump()

```
string AstNodePeriod::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

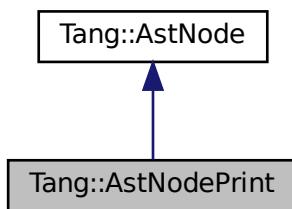
- [include/astNodePeriod.hpp](#)
- [src/astNodePeriod.cpp](#)

5.22 Tang::AstNodePrint Class Reference

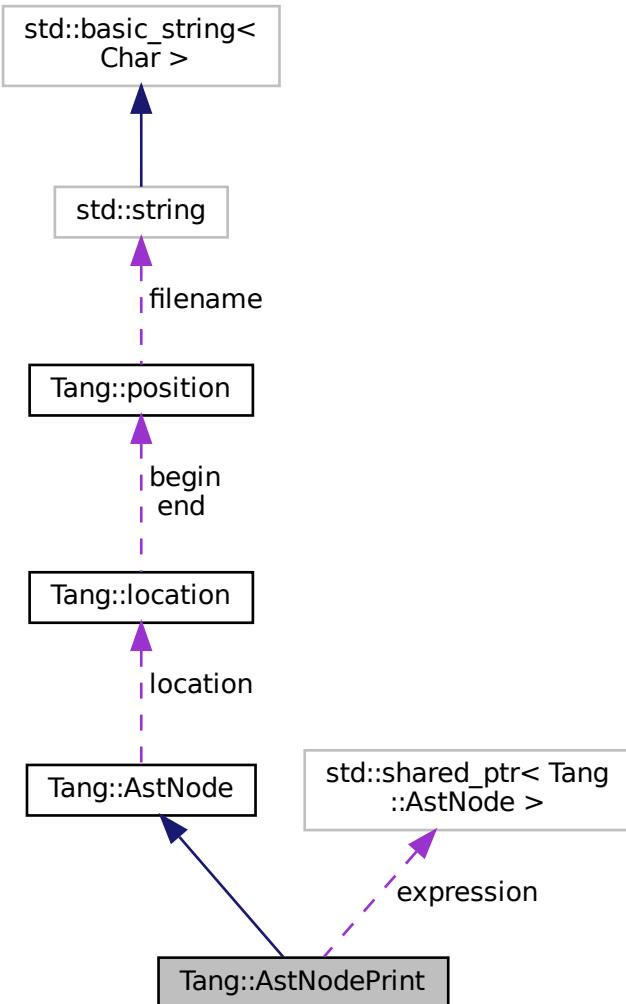
An [AstNode](#) that represents a print typeeration.

```
#include <astNodePrint.hpp>
```

Inheritance diagram for Tang::AstNodePrint:



Collaboration diagram for Tang::AstNodePrint:



Public Types

- enum `Type` { `Default` }
The type of print() requested.
- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Public Member Functions

- `AstNodePrint (Type type, std::shared_ptr< AstNode > expression, Tang::location location)`
The constructor.
- `virtual std::string dump (std::string indent="") const override`

Return a string that describes the contents of the node.

- virtual void [compile](#) ([Tang::Program](#) &program) const override
Compile the ast of the provided [Tang::Program](#).
- virtual void [compilePreprocess](#) ([Program](#) &program, [PreprocessState](#) state) const override
Run any preprocess analysis needed before compilation.

Public Attributes

- [Tang::location](#) location
The location associated with this node.

Private Attributes

- [Type](#) type
The type of print() being requested.
- std::shared_ptr<[AstNode](#)> expression
The expression to be printed.

5.22.1 Detailed Description

An [AstNode](#) that represents a print typeeration.

5.22.2 Member Enumeration Documentation

5.22.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	AstNode is part of an assignment expression.

5.22.2.2 Type

```
enum Tang::AstNodePrint::Type
```

The type of print() requested.

Enumerator

Default	Use the default print.
---------	------------------------

5.22.3 Constructor & Destructor Documentation

5.22.3.1 AstNodePrint()

```
AstNodePrint::AstNodePrint (
    Type type,
    std::shared_ptr< AstNode > expression,
    Tang::location location )
```

The constructor.

Parameters

<i>type</i>	The Tang::AstNodePrint::Type being requested.
<i>expression</i>	The expression to be printed.
<i>location</i>	The location associated with the expression.

5.22.4 Member Function Documentation

5.22.4.1 compile()

```
void AstNodePrint::compile (
    Tang::Program & program ) const [override], [virtual]
```

Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

5.22.4.2 compilePreprocess()

```
void AstNodePrint::compilePreprocess (
```

```
Program & program,
PreprocessState state ) const [override], [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

5.22.4.3 dump()

```
string AstNodePrint::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

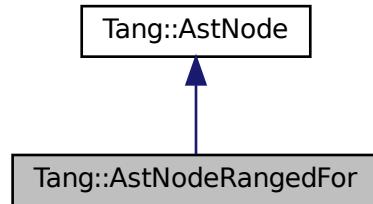
- [include/astNodePrint.hpp](#)
- [src/astNodePrint.cpp](#)

5.23 Tang::AstNodeRangedFor Class Reference

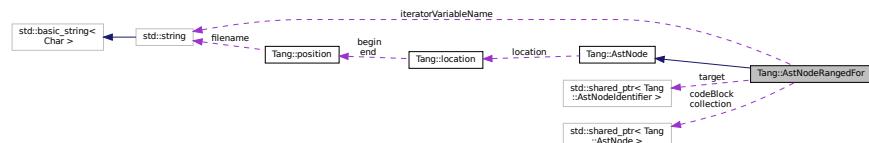
An [AstNode](#) that represents a ranged for() statement.

```
#include <astNodeRangedFor.hpp>
```

Inheritance diagram for Tang::AstNodeRangedFor:



Collaboration diagram for Tang::AstNodeRangedFor:



Public Types

- enum [PreprocessState](#) : int { [Default](#) = 0 , [IsAssignment](#) = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- [AstNodeRangedFor](#) ([std::shared_ptr< AstNodeIdentifier >](#) [target](#), [std::shared_ptr< AstNode >](#) [collection](#), [std::shared_ptr< AstNode >](#) [codeBlock](#), [Tang::location](#) [location](#))
The constructor.
- virtual std::string [dump](#) (std::string [indent](#)= "") const override
Return a string that describes the contents of the node.
- virtual void [compile](#) ([Tang::Program](#) &[program](#)) const override
Compile the ast of the provided [Tang::Program](#).
- virtual void [compilePreprocess](#) ([Program](#) &[program](#), [PreprocessState](#) [state](#)) const override
Run any preprocess analysis needed before compilation.

Public Attributes

- [Tang::location](#) [location](#)
The location associated with this node.

Private Attributes

- std::shared_ptr< AstNodeIdentifier > target
The target variable to hold the value for the current loop iteration.
- std::shared_ptr< AstNode > collection
The collection through which to iterate.
- std::shared_ptr< AstNode > codeBlock
The code block executed when the condition is true.
- std::string iteratorVariableName
The unique variable name that this iterator will use to persist its state on the stack.

5.23.1 Detailed Description

An [AstNode](#) that represents a ranged for() statement.

5.23.2 Member Enumeration Documentation

5.23.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	AstNode is part of an assignment expression.

5.23.3 Constructor & Destructor Documentation

5.23.3.1 AstNodeRangedFor()

```
AstNodeRangedFor::AstNodeRangedFor (
    std::shared_ptr< AstNodeIdentifier > target,
    std::shared_ptr< AstNode > collection,
    std::shared_ptr< AstNode > codeBlock,
    Tang::location location )
```

The constructor.

Parameters

<i>target</i>	The target variable to hold the value for the current loop iteration.
<i>collection</i>	The collection through which to iterate.
<i>codeBlock</i>	The statement executed when the condition is true.
<i>location</i>	The location associated with the expression.

5.23.4 Member Function Documentation**5.23.4.1 compile()**

```
void AstNodeRangedFor::compile (
    Tang::Program & program ) const [override], [virtual]
```

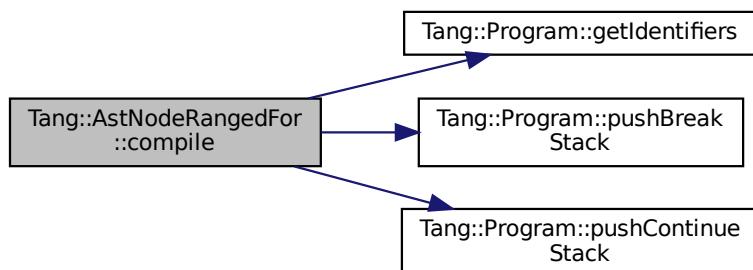
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:

**5.23.4.2 compilePreprocess()**

```
void AstNodeRangedFor::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

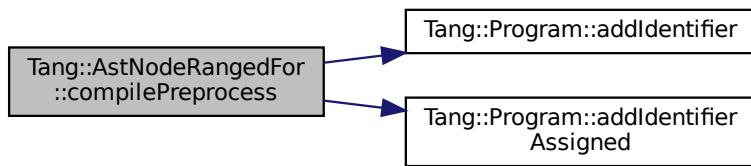
Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:

**5.23.4.3 dump()**

```
string AstNodeRangedFor::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

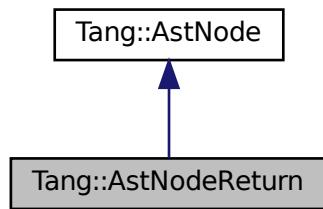
- include/astNodeRangedFor.hpp
- src/astNodeRangedFor.cpp

5.24 Tang::AstNodeReturn Class Reference

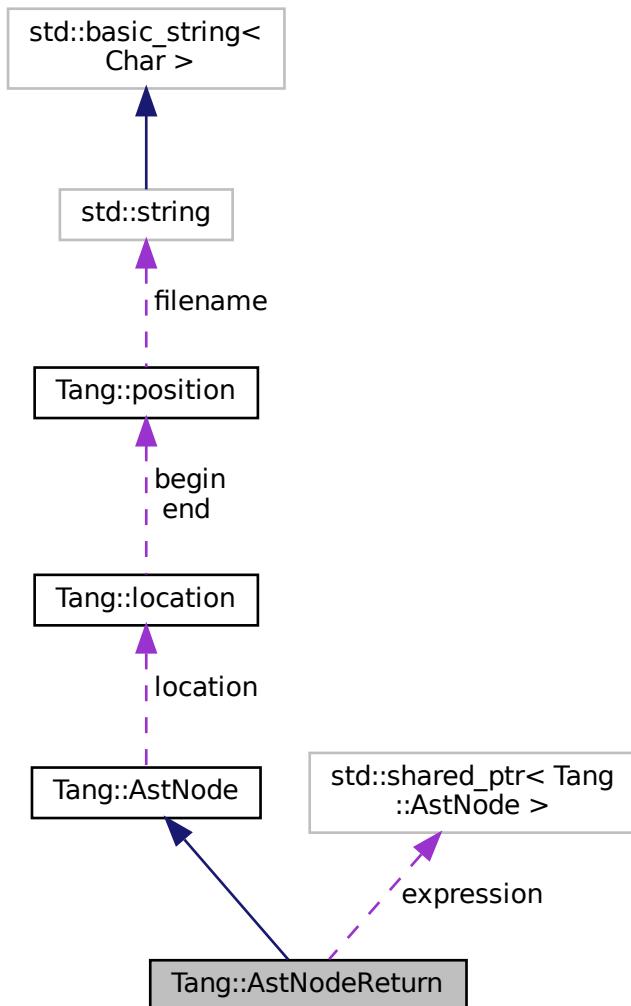
An [AstNode](#) that represents a `return` statement.

```
#include <astNodeReturn.hpp>
```

Inheritance diagram for Tang::AstNodeReturn:



Collaboration diagram for Tang::AstNodeReturn:



Public Types

- enum **PreprocessState** : int { **Default** = 0 , **IsAssignment** = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- AstNodeReturn** (`std::shared_ptr< AstNode > expression, Tang::location location)`
The constructor.
- virtual std::string dump** (`std::string indent=""`) const override
Return a string that describes the contents of the node.
- virtual void compile** (`Tang::Program &program`) const override
Compile the ast of the provided `Tang::Program`.
- virtual void compilePreprocess** (`Program &program, PreprocessState state`) const override
Run any preprocess analysis needed before compilation.

Public Attributes

- `Tang::location location`
The location associated with this node.

Private Attributes

- `std::shared_ptr< AstNode > expression`
The expression to which the operation will be applied.

5.24.1 Detailed Description

An `AstNode` that represents a `return` statement.

5.24.2 Member Enumeration Documentation

5.24.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	<code>AstNode</code> is part of an assignment expression.

5.24.3 Constructor & Destructor Documentation

5.24.3.1 AstNodeReturn()

```
AstNodeReturn::AstNodeReturn (
    std::shared_ptr< AstNode > expression,
    Tang::location location )
```

The constructor.

Parameters

<code>expression</code>	The expression to be returned.
<code>location</code>	The location associated with the return statement.

5.24.4 Member Function Documentation

5.24.4.1 compile()

```
void AstNodeReturn::compile (
    Tang::Program & program ) const [override], [virtual]
```

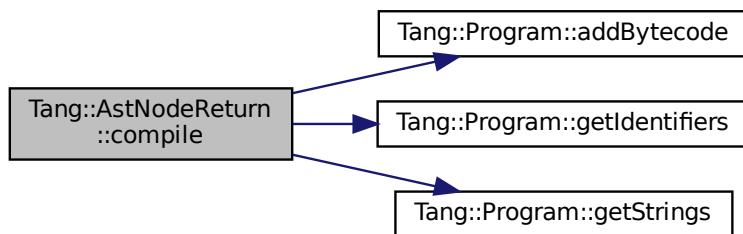
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.24.4.2 compilePreprocess()

```
void AstNodeReturn::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

5.24.4.3 `dump()`

```
string AstNodeReturn::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

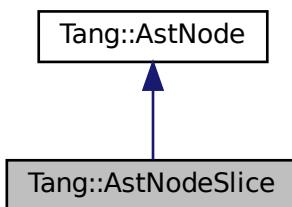
- [include/astNodeReturn.hpp](#)
- [src/astNodeReturn.cpp](#)

5.25 Tang::AstNodeSlice Class Reference

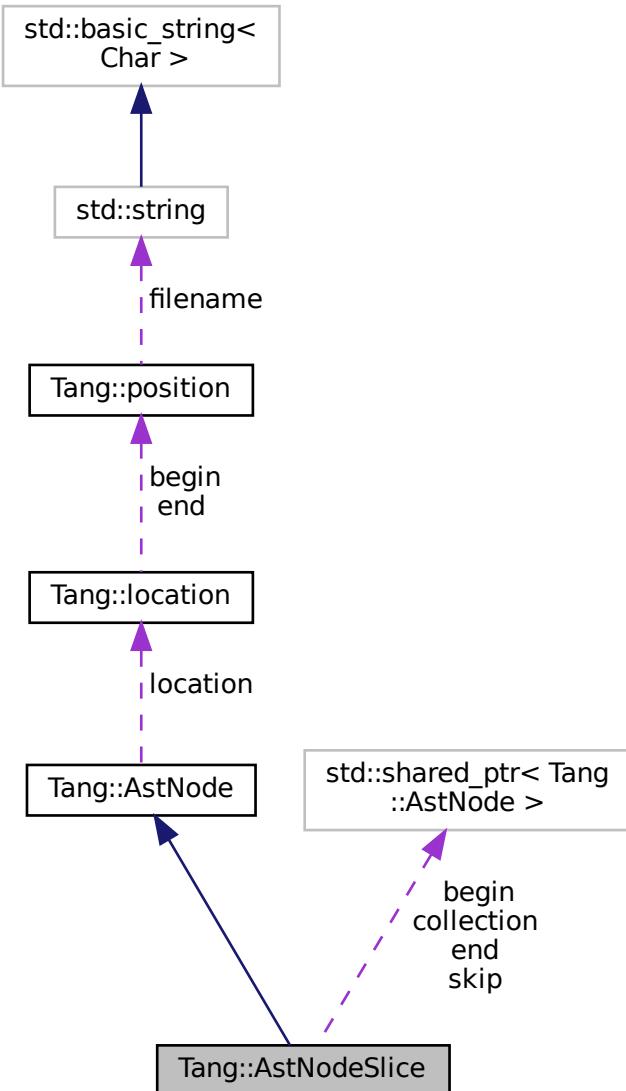
An [AstNode](#) that represents a ternary expression.

```
#include <astNodeSlice.hpp>
```

Inheritance diagram for Tang::AstNodeSlice:



Collaboration diagram for Tang::AstNodeSlice:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodeSlice (std::shared_ptr< AstNode > collection, std::shared_ptr< AstNode > begin, std::shared_ptr< AstNode > end, std::shared_ptr< AstNode > slice, Tang::location location)`
- The constructor.*

- virtual std::string **dump** (std::string indent="") const override
Return a string that describes the contents of the node.
- virtual void **compile** ([Tang::Program](#) &program) const override
Compile the ast of the provided [Tang::Program](#).
- virtual void **compilePreprocess** ([Program](#) &program, [PreprocessState](#) state) const override
Run any preprocess analysis needed before compilation.

Public Attributes

- [Tang::location](#) **location**
The location associated with this node.

Private Attributes

- std::shared_ptr<[AstNode](#)> **collection**
The collection which will be sliced.
- std::shared_ptr<[AstNode](#)> **begin**
The begin index position of the slice.
- std::shared_ptr<[AstNode](#)> **end**
The end index position of the slice.
- std::shared_ptr<[AstNode](#)> **skip**
The skip index position of the slice.

5.25.1 Detailed Description

An [AstNode](#) that represents a ternary expression.

5.25.2 Member Enumeration Documentation

5.25.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	AstNode is part of an assignment expression.

5.25.3 Constructor & Destructor Documentation

5.25.3.1 AstNodeSlice()

```
AstNodeSlice::AstNodeSlice (
    std::shared_ptr< AstNode > collection,
    std::shared_ptr< AstNode > begin,
    std::shared_ptr< AstNode > end,
    std::shared_ptr< AstNode > slice,
    Tang::location location )
```

The constructor.

Parameters

<i>collection</i>	The collection which will be sliced.
<i>begin</i>	The begin index position of the slice.
<i>end</i>	The end index position of the slice.
<i>skip</i>	The skip index position of the slice.
<i>location</i>	The location associated with the expression.

5.25.4 Member Function Documentation

5.25.4.1 compile()

```
void AstNodeSlice::compile (
    Tang::Program & program ) const [override], [virtual]
```

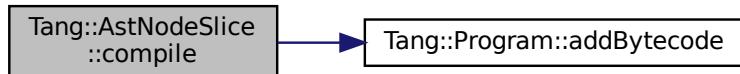
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.25.4.2 compilePreprocess()

```
void AstNodeSlice::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

5.25.4.3 dump()

```
string AstNodeSlice::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

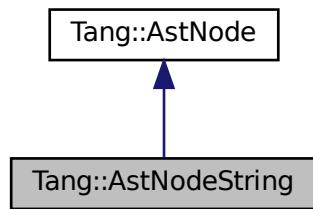
- [include/astNodeSlice.hpp](#)
- [src/astNodeSlice.cpp](#)

5.26 Tang::AstNodeString Class Reference

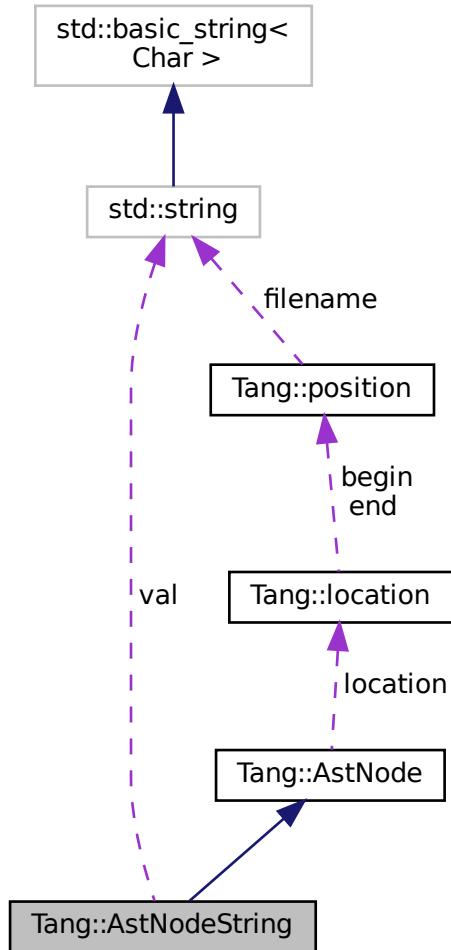
An [AstNode](#) that represents a string literal.

```
#include <astNodeString.hpp>
```

Inheritance diagram for Tang::AstNodeString:



Collaboration diagram for Tang::AstNodeString:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodeString (const std::string &text, Tang::location location)`
Construct a Trusted string.
- `AstNodeString (const std::string &text, UnicodeString::Type type, Tang::location location)`
Construct a string that is either Trusted or Untrusted.
- virtual std::string `dump (std::string indent="") const override`
Return a string that describes the contents of the node.
- virtual void `compile (Tang::Program &program) const override`

Compile the ast of the provided [Tang::Program](#).

- virtual void [compilePreprocess](#) ([Program](#) &program, [PreprocessState](#) state) const override

Run any preprocess analysis needed before compilation.

- void [compileLiteral](#) ([Tang::Program](#) &program) const

Compile the string and push it onto the stack.

- const std::string & [getVal](#) () const

Get the string value that this AST node represents.

- const [UnicodeString::Type](#) & [getType](#) () const

Get the type of string that this AST node represents.

Public Attributes

- [Tang::location](#) location

The location associated with this node.

Private Attributes

- std::string val

The string value being stored.

- [UnicodeString::Type](#) type

The [UnicodeString::Type](#) that the string should be considered.

5.26.1 Detailed Description

An [AstNode](#) that represents a string literal.

5.26.2 Member Enumeration Documentation

5.26.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	AstNode is part of an assignment expression.

5.26.3 Constructor & Destructor Documentation

5.26.3.1 AstNodeString() [1/2]

```
AstNodeString::AstNodeString (
    const std::string & text,
    Tang::location location )
```

Construct a Trusted string.

Parameters

<i>text</i>	The string to represent.
<i>location</i>	The location associated with the expression.

5.26.3.2 AstNodeString() [2/2]

```
AstNodeString::AstNodeString (
    const std::string & text,
    UnicodeString::Type type,
    Tang::location location )
```

Construct a string that is either Trusted or Untrusted.

Parameters

<i>text</i>	The string to represent.
<i>type</i>	The UnicodeString::Type that the string should be considered.
<i>location</i>	The location associated with the expression.

5.26.4 Member Function Documentation

5.26.4.1 compile()

```
void AstNodeString::compile (
    Tang::Program & program ) const [override], [virtual]
```

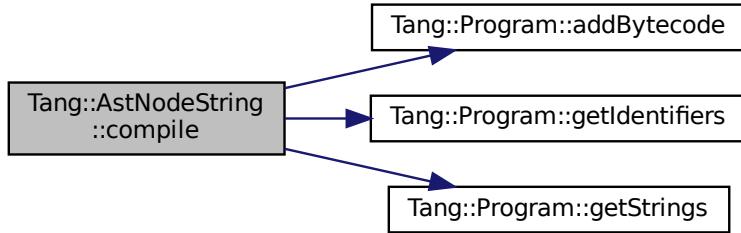
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.26.4.2 compileLiteral()

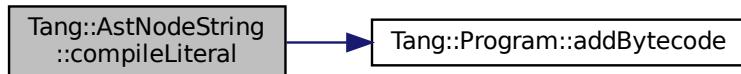
```
void AstNodeString::compileLiteral (
    Tang::Program & program ) const
```

Compile the string and push it onto the stack.

Parameters

<code>program</code>	The Program which will hold the generated Bytecode.
----------------------	---

Here is the call graph for this function:



5.26.4.3 compilePreprocess()

```
void AstNodeString::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

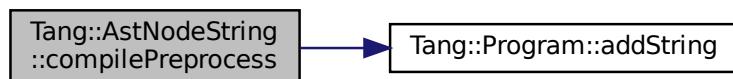
Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:

**5.26.4.4 dump()**

```
string AstNodeString::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

5.26.4.5 getType()

```
const UnicodeString::Type & AstNodeString::getType ( ) const
```

Get the type of string that this AST node represents.

Returns

The type of string that this AST node represents.

5.26.4.6 getVal()

```
const std::string & AstNodeString::getVal ( ) const
```

Get the string value that this AST node represents.

Returns

The string value that this AST node represents.

The documentation for this class was generated from the following files:

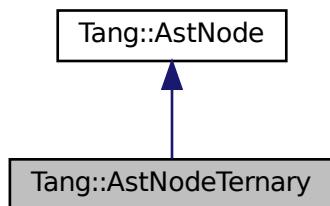
- include/astNodeString.hpp
- src/astNodeString.cpp

5.27 Tang::AstNodeTernary Class Reference

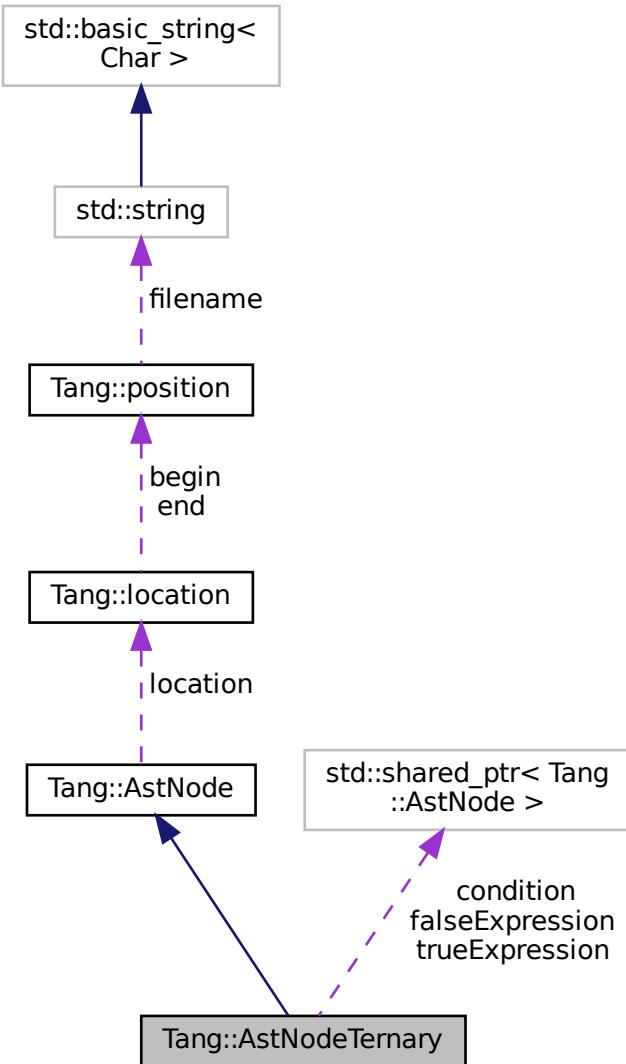
An [AstNode](#) that represents a ternary expression.

```
#include <astNodeTernary.hpp>
```

Inheritance diagram for Tang::AstNodeTernary:



Collaboration diagram for Tang::AstNodeTernary:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodeTernary (std::shared_ptr< AstNode > condition, std::shared_ptr< AstNode > trueExpression, std::shared_ptr< AstNode > falseExpression, Tang::location location)`
The constructor.
- `virtual std::string dump (std::string indent="") const override`

Return a string that describes the contents of the node.

- virtual void `compile (Tang::Program &program)` const override
Compile the ast of the provided Tang::Program.
- virtual void `compilePreprocess (Program &program, PreprocessState state)` const override
Run any preprocess analysis needed before compilation.

Public Attributes

- `Tang::location location`
The location associated with this node.

Private Attributes

- `std::shared_ptr< AstNode > condition`
The expression which determines whether the trueExpression or falseExpression is executed.
- `std::shared_ptr< AstNode > trueExpression`
The expression executed when the condition is true.
- `std::shared_ptr< AstNode > falseExpression`
The expression executed when the condition is false.

5.27.1 Detailed Description

An `AstNode` that represents a ternary expression.

5.27.2 Member Enumeration Documentation

5.27.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	<code>AstNode</code> is part of an assignment expression.

5.27.3 Constructor & Destructor Documentation

5.27.3.1 AstNodeTernary()

```
AstNodeTernary::AstNodeTernary (
    std::shared_ptr< AstNode > condition,
    std::shared_ptr< AstNode > trueExpression,
    std::shared_ptr< AstNode > falseExpression,
    Tang::location location )
```

The constructor.

Parameters

<i>condition</i>	The expression which determines whether the trueExpression or falseExpression is executed.
<i>trueExpression</i>	The expression executed when the condition is true.
<i>falseExpression</i>	The expression executed when the condition is false.
<i>location</i>	The location associated with the expression.

5.27.4 Member Function Documentation

5.27.4.1 compile()

```
void AstNodeTernary::compile (
    Tang::Program & program ) const [override], [virtual]
```

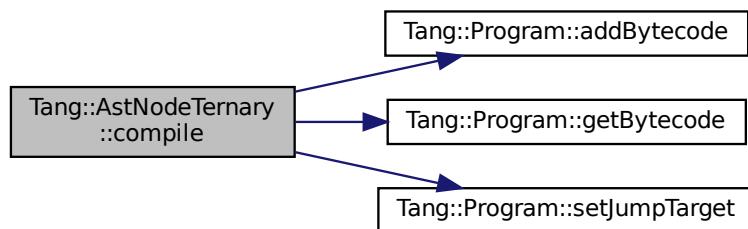
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.27.4.2 compilePreprocess()

```
void AstNodeTernary::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

5.27.4.3 dump()

```
string AstNodeTernary::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

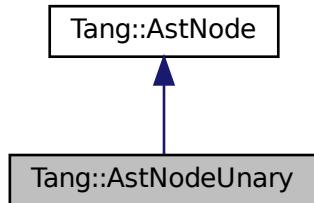
- [include/astNodeTernary.hpp](#)
- [src/astNodeTernary.cpp](#)

5.28 Tang::AstNodeUnary Class Reference

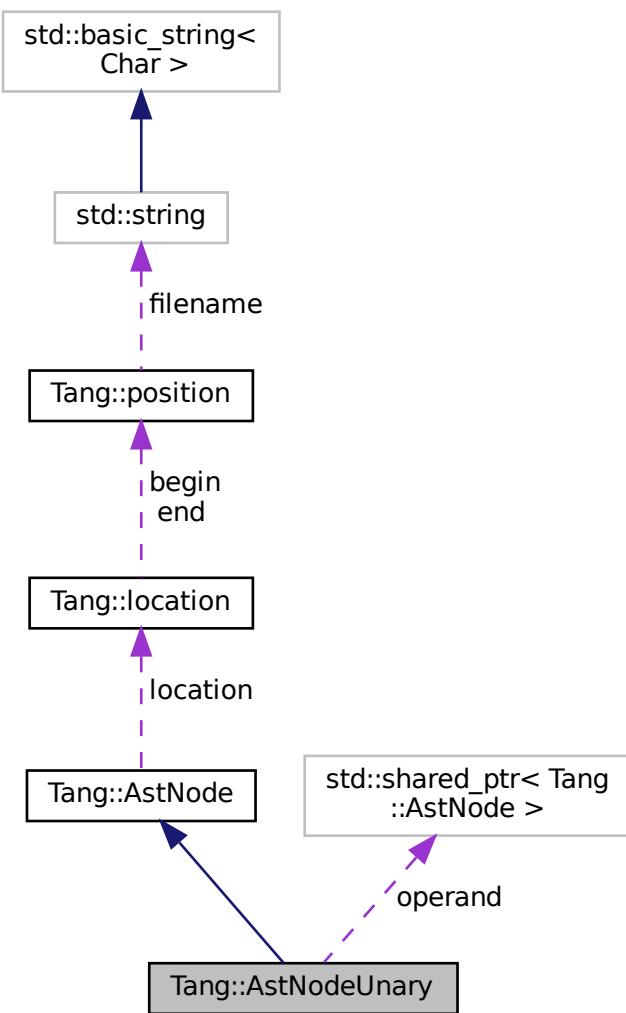
An [AstNode](#) that represents a unary negation.

```
#include <astNodeUnary.hpp>
```

Inheritance diagram for Tang::AstNodeUnary:



Collaboration diagram for Tang::AstNodeUnary:



Public Types

- enum `Operator` { `Negative` , `Not` }
The type of operation.
- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Public Member Functions

- `AstNodeUnary (Operator op, std::shared_ptr< AstNode > operand, Tang::location location)`
The constructor.
- virtual std::string `dump` (std::string indent="") const override
Return a string that describes the contents of the node.
- virtual void `compile` (Tang::Program &program) const override
Compile the ast of the provided Tang::Program.
- virtual void `compilePreprocess` (Program &program, PreprocessState state) const override
Run any preprocess analysis needed before compilation.

Public Attributes

- `Tang::location location`
The location associated with this node.

Private Attributes

- `Operator op`
The operation which will be applied to the operand.
- `std::shared_ptr< AstNode > operand`
The operand to which the operation will be applied.

5.28.1 Detailed Description

An `AstNode` that represents a unary negation.

5.28.2 Member Enumeration Documentation

5.28.2.1 Operator

```
enum Tang::AstNodeUnary::Operator
```

The type of operation.

Enumerator

Negative	Compute the negative (-).
Not	Compute the logical not (!).

5.28.2.2 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	AstNode is part of an assignment expression.

5.28.3 Constructor & Destructor Documentation**5.28.3.1 AstNodeUnary()**

```
AstNodeUnary::AstNodeUnary (
    Operator op,
    std::shared_ptr< AstNode > operand,
    Tang::location location )
```

The constructor.

Parameters

<i>op</i>	The Tang::AstNodeUnary::Operator to apply to the operand.
<i>operand</i>	The expression to be operated on.
<i>location</i>	The location associated with the expression.

5.28.4 Member Function Documentation**5.28.4.1 compile()**

```
void AstNodeUnary::compile (
    Tang::Program & program ) const [override], [virtual]
```

Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

5.28.4.2 compilePreprocess()

```
void AstNodeUnary::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

5.28.4.3 dump()

```
string AstNodeUnary::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

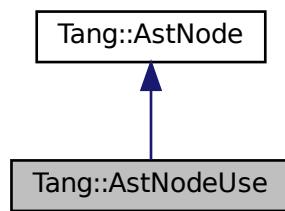
- [include/astNodeUnary.hpp](#)
- [src/astNodeUnary.cpp](#)

5.29 Tang::AstNodeUse Class Reference

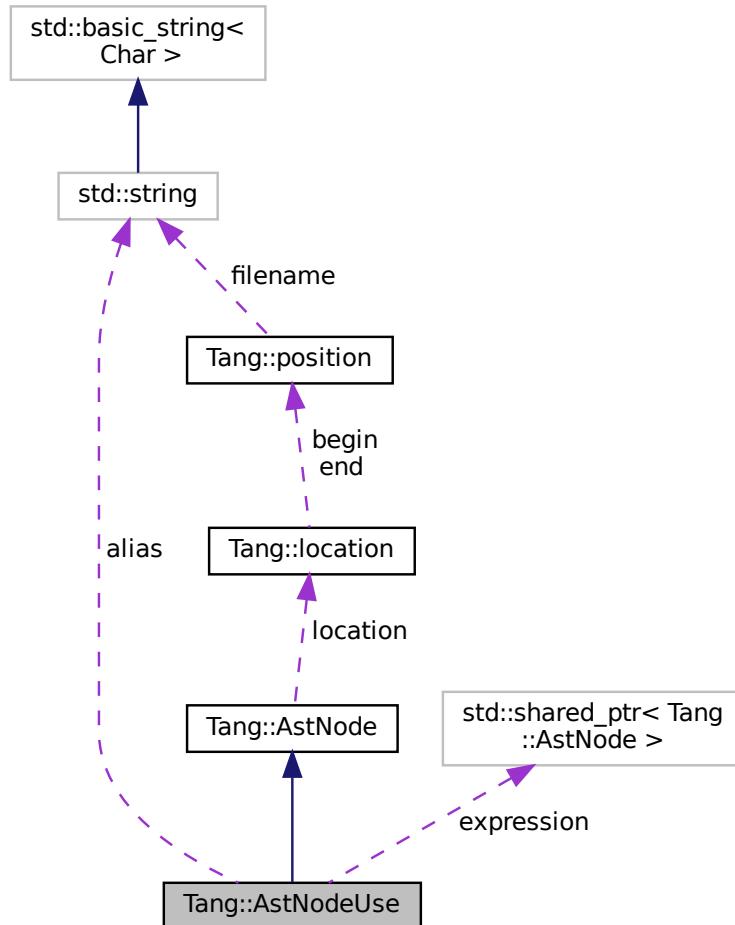
An [AstNode](#) that represents the inclusion of a library into the script.

```
#include <astNodeUse.hpp>
```

Inheritance diagram for Tang::AstNodeUse:



Collaboration diagram for Tang::AstNodeUse:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodeUse (std::shared_ptr< AstNode > expression, const std::string &alias, Tang::location location)`
The constructor.
- `virtual std::string dump (std::string indent="") const override`
Return a string that describes the contents of the node.
- `virtual void compile (Tang::Program &program) const override`
Compile the ast of the provided `Tang::Program`.
- `virtual void compilePreprocess (Program &program, PreprocessState state) const override`
Run any preprocess analysis needed before compilation.

Public Attributes

- std::string **alias**
The alias to use for the library expression.
- std::shared_ptr< AstNode > **expression**
The library expression.
- Tang::location **location**
The location associated with this node.

5.29.1 Detailed Description

An [AstNode](#) that represents the inclusion of a library into the script.

A library or the library attributes will be represented by the `alias` within the script.

5.29.2 Member Enumeration Documentation

5.29.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	AstNode is part of an assignment expression.

5.29.3 Constructor & Destructor Documentation

5.29.3.1 AstNodeUse()

```
AstNodeUse::AstNodeUse (
    std::shared_ptr< AstNode > expression,
    const std::string & alias,
    Tang::location location )
```

The constructor.

Parameters

<code>expression</code>	The library expression.
<code>alias</code>	An alias used to access the library expression within the script.
<code>location</code>	The location associated with the expression.

5.29.4 Member Function Documentation

5.29.4.1 compile()

```
void AstNodeUse::compile (
    Tang::Program & program ) const [override], [virtual]
```

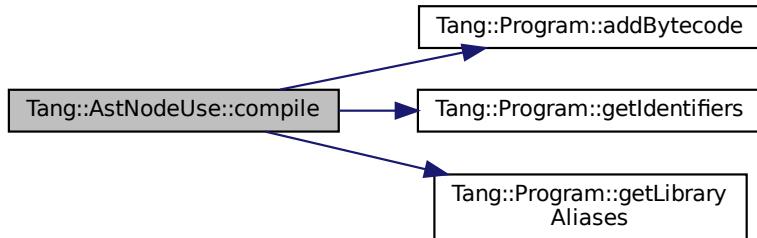
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.29.4.2 compilePreprocess()

```
void AstNodeUse::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

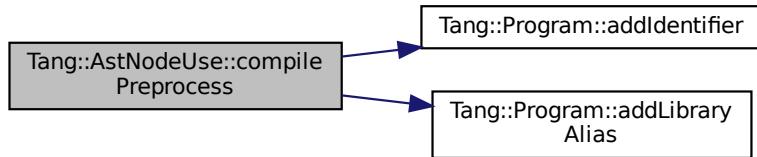
Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.29.4.3 dump()

```
string AstNodeUse::dump (\n    std::string indent = "") const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

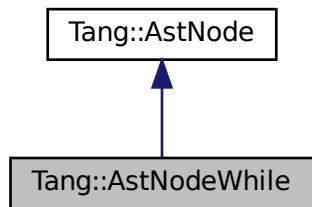
- [include/astNodeUse.hpp](#)
- [src/astNodeUse.cpp](#)

5.30 Tang::AstNodeWhile Class Reference

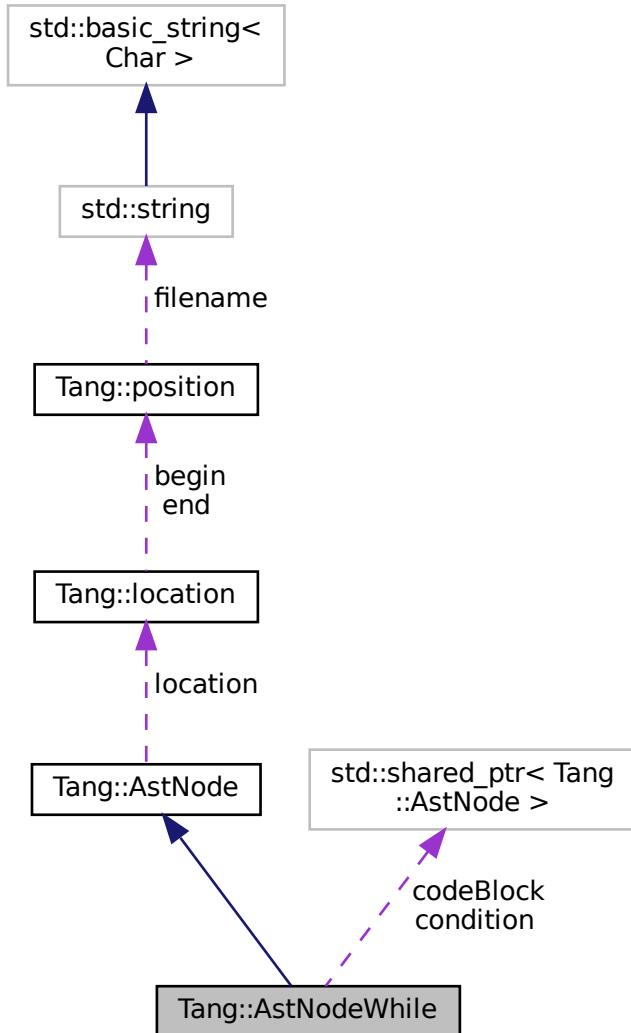
An [AstNode](#) that represents a while statement.

```
#include <astNodeWhile.hpp>
```

Inheritance diagram for Tang::AstNodeWhile:



Collaboration diagram for Tang::AstNodeWhile:



Public Types

- enum `PreprocessState` : int { `Default` = 0 , `IsAssignment` = 1 }
- Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.*

Public Member Functions

- `AstNodeWhile (std::shared_ptr< AstNode > condition, std::shared_ptr< AstNode > codeBlock, Tang::location location)`
The constructor.
- `virtual std::string dump (std::string indent="") const override`
Return a string that describes the contents of the node.

- virtual void `compile (Tang::Program &program)` const override
Compile the ast of the provided Tang::Program.
- virtual void `compilePreprocess (Program &program, PreprocessState state)` const override
Run any preprocess analysis needed before compilation.

Public Attributes

- `Tang::location location`
The location associated with this node.

Private Attributes

- `std::shared_ptr< AstNode > condition`
The expression which determines whether or not the code block will continue to be executed.
- `std::shared_ptr< AstNode > codeBlock`
The code block executed when the condition is true.

5.30.1 Detailed Description

An `AstNode` that represents a while statement.

5.30.2 Member Enumeration Documentation

5.30.2.1 PreprocessState

```
enum Tang::AstNode::PreprocessState : int [inherited]
```

Bit flags to indicate the state of the preprocess scan as it recursively evaluates the AST.

Enumerator

Default	The default state.
IsAssignment	<code>AstNode</code> is part of an assignment expression.

5.30.3 Constructor & Destructor Documentation

5.30.3.1 AstNodeWhile()

```
AstNodeWhile::AstNodeWhile (
    std::shared_ptr< AstNode > condition,
```

```
std::shared_ptr< AstNode > codeBlock,
Tang::location location )
```

The constructor.

Parameters

<i>condition</i>	The expression which determines whether the thenBlock or elseBlock is executed.
<i>codeBlock</i>	The statement executed when the condition is true.
<i>location</i>	The location associated with the expression.

5.30.4 Member Function Documentation

5.30.4.1 compile()

```
void AstNodeWhile::compile (
    Tang::Program & program ) const [override], [virtual]
```

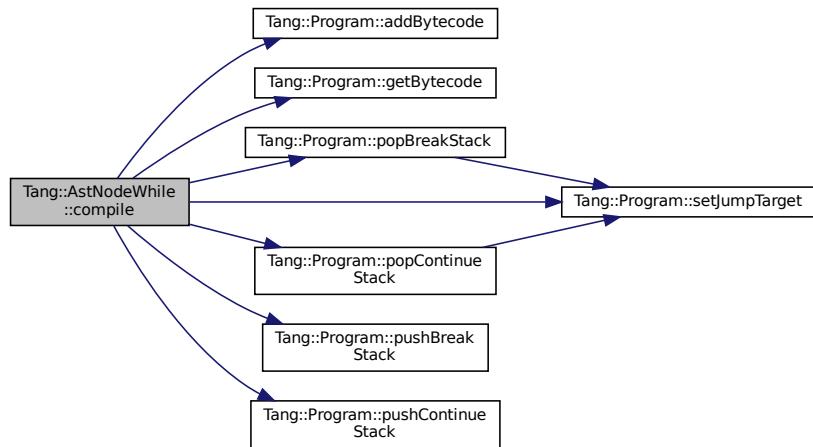
Compile the ast of the provided [Tang::Program](#).

Parameters

<i>program</i>	The Program which will hold the generated Bytecode.
----------------	---

Reimplemented from [Tang::AstNode](#).

Here is the call graph for this function:



5.30.4.2 compilePreprocess()

```
void AstNodeWhile::compilePreprocess (
    Program & program,
    PreprocessState state ) const [override], [virtual]
```

Run any preprocess analysis needed before compilation.

Parameters

<i>program</i>	The Tang::Program that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented from [Tang::AstNode](#).

5.30.4.3 dump()

```
string AstNodeWhile::dump (
    std::string indent = "" ) const [override], [virtual]
```

Return a string that describes the contents of the node.

Parameters

<i>indent</i>	A string used to indent the dump.
---------------	-----------------------------------

Returns

The value as a string.

Reimplemented from [Tang::AstNode](#).

The documentation for this class was generated from the following files:

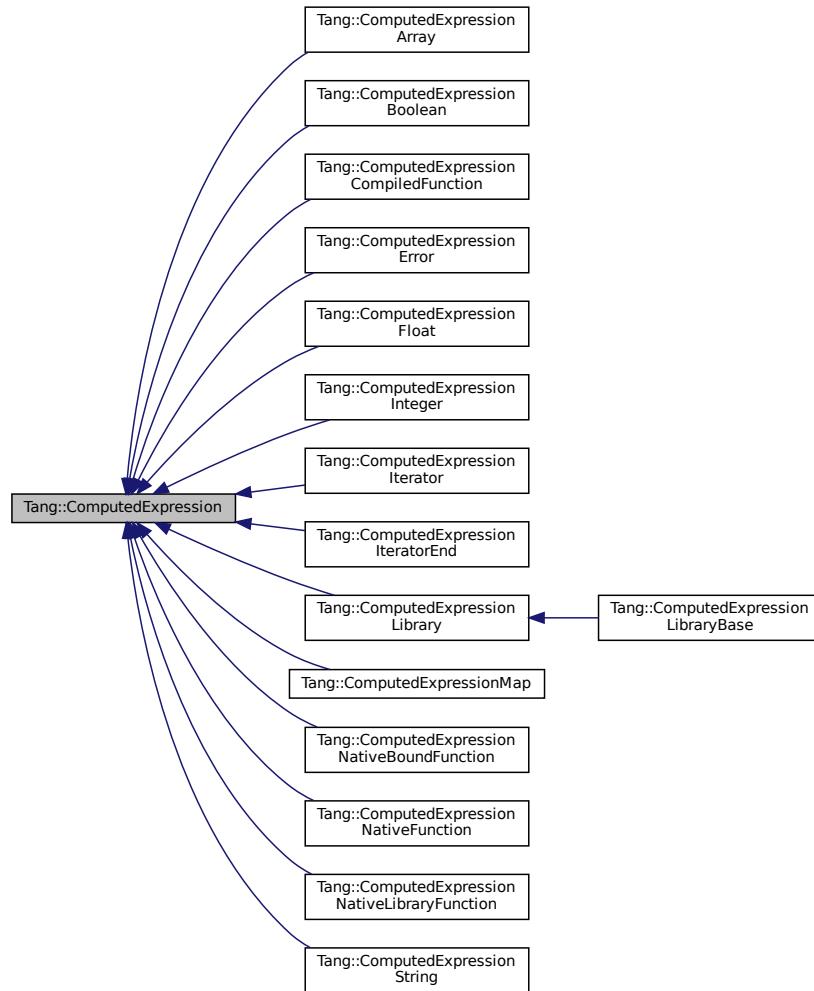
- [include/astNodeWhile.hpp](#)
- [src/astNodeWhile.cpp](#)

5.31 Tang::ComputedExpression Class Reference

Represents the result of a computation that has been executed.

```
#include <computedExpression.hpp>
```

Inheritance diagram for Tang::ComputedExpression:



Public Member Functions

- `virtual ~ComputedExpression ()`
The object destructor.
- `virtual std::string dump () const`
Output the contents of the `ComputedExpression` as a string.
- `virtual std::string __asCode () const`
Output the contents of the `ComputedExpression` as a string similar to how it would be represented as code.
- `virtual bool isCopyNeeded () const`
Determine whether or not a copy is needed.
- `virtual GarbageCollected makeCopy () const`
Make a copy of the `ComputedExpression` (recursively, if appropriate).
- `virtual bool is_equal (const Tang::integer_t &val) const`
Check whether or not the computed expression is equal to another value.
- `virtual bool is_equal (const Tang::float_t &val) const`
Check whether or not the computed expression is equal to another value.

- virtual bool `is_equal` (const bool &val) const
Check whether or not the computed expression is equal to another value.
- virtual bool `is_equal` (const std::string &val) const
Check whether or not the computed expression is equal to another value.
- virtual bool `is_equal` (const Error &val) const
Check whether or not the computed expression is equal to another value.
- virtual bool `is_equal` (const std::nullptr_t &val) const
Check whether or not the computed expression is equal to another value.
- virtual `GarbageCollected __assign_index` (const `GarbageCollected` &index, const `GarbageCollected` &value)
Perform an index assignment to the supplied value.
- virtual `GarbageCollected __add` (const `GarbageCollected` &rhs) const
Compute the result of adding this value and the supplied value.
- virtual `GarbageCollected __subtract` (const `GarbageCollected` &rhs) const
Compute the result of subtracting this value and the supplied value.
- virtual `GarbageCollected __multiply` (const `GarbageCollected` &rhs) const
Compute the result of multiplying this value and the supplied value.
- virtual `GarbageCollected __divide` (const `GarbageCollected` &rhs) const
Compute the result of dividing this value and the supplied value.
- virtual `GarbageCollected __modulo` (const `GarbageCollected` &rhs) const
Compute the result of moduloing this value and the supplied value.
- virtual `GarbageCollected __negative` () const
Compute the result of negating this value.
- virtual `GarbageCollected __not` () const
Compute the logical not of this value.
- virtual `GarbageCollected __lessThan` (const `GarbageCollected` &rhs) const
Compute the "less than" comparison.
- virtual `GarbageCollected __equal` (const `GarbageCollected` &rhs) const
Perform an equality test.
- virtual `GarbageCollected __period` (const `GarbageCollected` &member, std::shared_ptr<`TangBase`> &tang) const
Perform a member access (period) operation.
- virtual `GarbageCollected __index` (const `GarbageCollected` &index) const
Perform an index operation.
- virtual `GarbageCollected __slice` (const `GarbageCollected` &begin, const `GarbageCollected` &end, const `GarbageCollected` &skip) const
Perform a slice operation.
- virtual `GarbageCollected __getIterator` (const `GarbageCollected` &collection) const
Get an iterator for the expression.
- virtual `GarbageCollected __iteratorNext` (size_t index=0) const
Get the next iterative value.
- virtual `GarbageCollected __integer` () const
Perform a type cast to integer.
- virtual `GarbageCollected __float` () const
Perform a type cast to float.
- virtual `GarbageCollected __boolean` () const
Perform a type cast to boolean.
- virtual `GarbageCollected __string` () const
Perform a type cast to string.

5.31.1 Detailed Description

Represents the result of a computation that has been executed.

By default, it will represent a NULL value.

5.31.2 Member Function Documentation

5.31.2.1 __add()

```
GarbageCollected ComputedExpression::__add (
    const GarbageCollected & rhs ) const [virtual]
```

Compute the result of adding this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to add to this.
------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.31.2.2 __asCode()

```
string ComputedExpression::__asCode ( ) const [virtual]
```

Output the contents of the [ComputedExpression](#) as a string similar to how it would be represented as code.

Returns

A code-string representation of the computed expression.

Reimplemented in [Tang::ComputedExpressionString](#).

5.31.2.3 __assign_index()

```
GarbageCollected ComputedExpression::__assign_index (
    const GarbageCollected & index,
    const GarbageCollected & value ) [virtual]
```

Perform an index assignment to the supplied value.

Parameters

<i>index</i>	The index to which the value should be applied.
<i>value</i>	The value to store.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.31.2.4 __boolean()

```
GarbageCollected ComputedExpression::__boolean ( ) const [virtual]
```

Perform a type cast to boolean.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.31.2.5 __divide()

```
GarbageCollected ComputedExpression::__divide (
    const GarbageCollected & rhs ) const [virtual]
```

Compute the result of dividing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to divide this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.31.2.6 __equal()

```
GarbageCollected ComputedExpression::__equal (
    const GarbageCollected & rhs ) const [virtual]
```

Perform an equality test.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionNativeLibraryFunction](#), [Tang::ComputedExpressionTang::ComputedExpressionNativeBoundFunction](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), [Tang::ComputedExpressionCompiledFunction](#), and [Tang::ComputedExpressionBoolean](#).

5.31.2.7 __float()

```
GarbageCollected ComputedExpression::__float () const [virtual]
```

Perform a type cast to float.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.31.2.8 __getIterator()

```
GarbageCollected ComputedExpression::__getIterator (
    const GarbageCollected & collection ) const [virtual]
```

Get an iterator for the expression.

Parameters

<i>collection</i>	The GarbageCollected value that will serve as the collection through which to iterate.
-------------------	--

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.31.2.9 __index()

```
GarbageCollected ComputedExpression::__index (
    const GarbageCollected & index ) const [virtual]
```

Perform an index operation.

Parameters

<i>index</i>	The index expression provided by the script.
--------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.31.2.10 __integer()

```
GarbageCollected ComputedExpression::__integer () const [virtual]
```

Perform a type cast to integer.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.31.2.11 __iteratorNext()

```
GarbageCollected ComputedExpression::__iteratorNext (
    size_t index = 0 ) const [virtual]
```

Get the next iterative value.

Parameters

<i>index</i>	The desired index value.
--------------	--------------------------

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIterator](#), and [Tang::ComputedExpressionArray](#).

5.31.2.12 __lessThan()

```
GarbageCollected ComputedExpression::__lessThan (
    const GarbageCollected & rhs ) const [virtual]
```

Compute the "less than" comparison.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.31.2.13 __modulo()

```
GarbageCollected ComputedExpression::__modulo (
    const GarbageCollected & rhs ) const [virtual]
```

Compute the result of moduloing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to modulo this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

5.31.2.14 __multiply()

```
GarbageCollected ComputedExpression::__multiply (
    const GarbageCollected & rhs ) const [virtual]
```

Compute the result of multiplying this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to multiply to this.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.31.2.15 `__negative()`

```
GarbageCollected ComputedExpression::__negative () const [virtual]
```

Compute the result of negating this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.31.2.16 `__not()`

```
GarbageCollected ComputedExpression::__not () const [virtual]
```

Compute the logical not of this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.31.2.17 `__period()`

```
GarbageCollected ComputedExpression::__period (
    const GarbageCollected & member,
    std::shared_ptr< TangBase > & tang ) const [virtual]
```

Perform a member access (period) operation.

Parameters

<i>member</i>	The member expression provided by the script.
---------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionLibrary](#).

5.31.2.18 __slice()

```
GarbageCollected ComputedExpression::__slice (
    const GarbageCollected & begin,
    const GarbageCollected & end,
    const GarbageCollected & skip ) const [virtual]
```

Perform a slice operation.

Convention will follow Python semantics, in which a slice will start at the provided index position, and go up to but not including the end index. The slice will default to an index increment of 1, but can be defined as another integer value.

Parameters

<i>begin</i>	The begin index expression provided by the script.
<i>end</i>	The end index expression provided by the script.
<i>skip</i>	The skip index expression provided by the script.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), and [Tang::ComputedExpressionArray](#).

5.31.2.19 __string()

```
GarbageCollected ComputedExpression::__string ( ) const [virtual]
```

Perform a type cast to string.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIteratorEnd](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionArray](#).

5.31.2.20 __subtract()

```
GarbageCollected ComputedExpression::__subtract (
    const GarbageCollected & rhs ) const [virtual]
```

Compute the result of subtracting this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to subtract from this.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.31.2.21 dump()

```
string ComputedExpression::dump ( ) const [virtual]
```

Output the contents of the [ComputedExpression](#) as a string.

Returns

A string representation of the computed expression.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionNativeLibraryFunction](#), [Tang::ComputedExpressionNativeBoundFunction](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionLibrary](#), [Tang::ComputedExpressionIteratorEnd](#), [Tang::ComputedExpressionIterator](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), [Tang::ComputedExpressionCompiledFunction](#), [Tang::ComputedExpressionBoolean](#), and [Tang::ComputedExpressionArray](#).

5.31.2.22 is_equal() [1/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const bool & val ) const [virtual]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionBoolean](#).

5.31.2.23 `is_equal()` [2/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Error & val ) const [virtual]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionError](#).

5.31.2.24 `is_equal()` [3/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::nullptr_t & val ) const [virtual]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

5.31.2.25 `is_equal()` [4/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::string & val ) const [virtual]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#).

5.31.2.26 is_equal() [5/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::float_t & val ) const [virtual]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.31.2.27 is_equal() [6/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::integer_t & val ) const [virtual]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.31.2.28 isCopyNeeded()

```
bool ComputedExpression::isCopyNeeded ( ) const [virtual]
```

Determine whether or not a copy is needed.

Copying is only required for ComputedExpressions which serve as containers, such as [ComputedExpressionArray](#) and [ComputedExpressionObject](#).

Returns

Whether or not a copy is needed.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.31.2.29 makeCopy()

`GarbageCollected ComputedExpression::makeCopy () const [virtual]`

Make a copy of the [ComputedExpression](#) (recursively, if appropriate).

Returns

A [Tang::GarbageCollected](#) value for the new [ComputedExpression](#).

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionNativeLibraryFunction](#), [Tang::ComputedExpression](#), [Tang::ComputedExpressionNativeBoundFunction](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionLibraryBase](#), [Tang::ComputedExpressionLibrary](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), [Tang::ComputedExpressionCompiledFunction](#), [Tang::ComputedExpressionBoolean](#), and [Tang::ComputedExpressionArray](#).

The documentation for this class was generated from the following files:

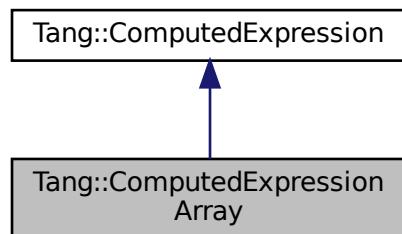
- [include/computedExpression.hpp](#)
- [src/computedExpression.cpp](#)

5.32 Tang::ComputedExpressionArray Class Reference

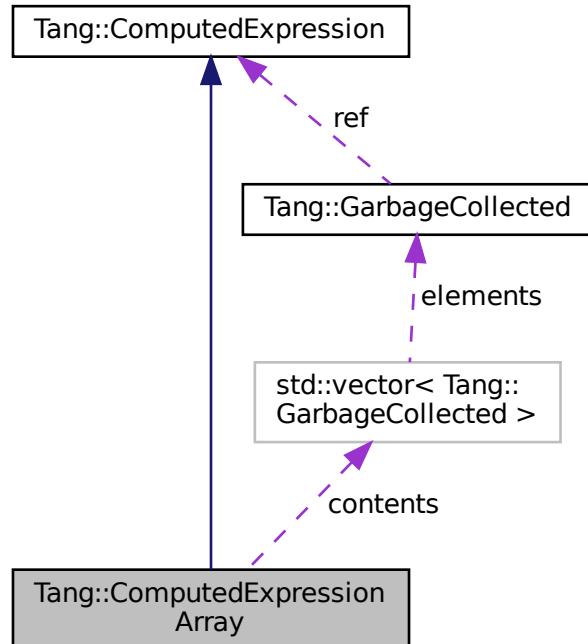
Represents an Array that is the result of a computation.

```
#include <computedExpressionArray.hpp>
```

Inheritance diagram for Tang::ComputedExpressionArray:



Collaboration diagram for Tang::ComputedExpressionArray:



Public Member Functions

- **ComputedExpressionArray (std::vector< Tang::GarbageCollected > contents)**
Construct an Array result.
- virtual std::string **dump () const override**
Output the contents of the [ComputedExpression](#) as a string.
- virtual bool **isCopyNeeded () const override**
Determine whether or not a copy is needed.
- **GarbageCollected makeCopy () const override**
Make a copy of the [ComputedExpression](#) (recursively, if appropriate).
- virtual **GarbageCollected __index (const GarbageCollected &index) const override**
Perform an index operation.
- virtual **GarbageCollected __slice (const GarbageCollected &begin, const GarbageCollected &end, const GarbageCollected &skip) const override**
Perform a slice operation.
- virtual **GarbageCollected __getIterator (const GarbageCollected &collection) const override**
Get an iterator for the expression.
- virtual **GarbageCollected __iteratorNext (size_t index) const override**
Get the next iterative value.
- virtual **GarbageCollected __assign_index (const GarbageCollected &index, const GarbageCollected &value) override**
Perform an index assignment to the supplied value.
- virtual **GarbageCollected __string () const override**

- `const std::vector< Tang::GarbageCollected > & getContents () const`
Return the contents of this object.
- `void append (const Tang::GarbageCollected &item)`
Append an item to the contents of this array object.
- `virtual std::string __asCode () const`
Output the contents of the `ComputedExpression` as a string similar to how it would be represented as code.
- `virtual bool is_equal (const Tang::integer_t &val) const`
Check whether or not the computed expression is equal to another value.
- `virtual bool is_equal (const Tang::float_t &val) const`
Check whether or not the computed expression is equal to another value.
- `virtual bool is_equal (const bool &val) const`
Check whether or not the computed expression is equal to another value.
- `virtual bool is_equal (const std::string &val) const`
Check whether or not the computed expression is equal to another value.
- `virtual bool is_equal (const Error &val) const`
Check whether or not the computed expression is equal to another value.
- `virtual bool is_equal (const std::nullptr_t &val) const`
Check whether or not the computed expression is equal to another value.
- `virtual GarbageCollected __add (const GarbageCollected &rhs) const`
Compute the result of adding this value and the supplied value.
- `virtual GarbageCollected __subtract (const GarbageCollected &rhs) const`
Compute the result of subtracting this value and the supplied value.
- `virtual GarbageCollected __multiply (const GarbageCollected &rhs) const`
Compute the result of multiplying this value and the supplied value.
- `virtual GarbageCollected __divide (const GarbageCollected &rhs) const`
Compute the result of dividing this value and the supplied value.
- `virtual GarbageCollected __modulo (const GarbageCollected &rhs) const`
Compute the result of moduloing this value and the supplied value.
- `virtual GarbageCollected __negative () const`
Compute the result of negating this value.
- `virtual GarbageCollected __not () const`
Compute the logical not of this value.
- `virtual GarbageCollected __lessThan (const GarbageCollected &rhs) const`
Compute the "less than" comparison.
- `virtual GarbageCollected __equal (const GarbageCollected &rhs) const`
Perform an equality test.
- `virtual GarbageCollected __period (const GarbageCollected &member, std::shared_ptr< TangBase > &tang) const`
Perform a member access (period) operation.
- `virtual GarbageCollected __integer () const`
Perform a type cast to integer.
- `virtual GarbageCollected __float () const`
Perform a type cast to float.
- `virtual GarbageCollected __boolean () const`
Perform a type cast to boolean.

Static Public Member Functions

- `static NativeBoundFunctionMap getMethods ()`
Return the member functions implemented for this particular expression type.

Private Attributes

- std::vector< [Tang::GarbageCollected](#) > contents
The array contents.

5.32.1 Detailed Description

Represents an Array that is the result of a computation.

5.32.2 Constructor & Destructor Documentation

5.32.2.1 ComputedExpressionArray()

```
ComputedExpressionArray::ComputedExpressionArray (
    std::vector< Tang::GarbageCollected > contents )
```

Construct an Array result.

Parameters

<code>val</code>	The integer value.
------------------	--------------------

5.32.3 Member Function Documentation

5.32.3.1 __add()

```
GarbageCollected ComputedExpression::__add (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of adding this value and the supplied value.

Parameters

<code>rhs</code>	The GarbageCollected value to add to this.
------------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.32.3.2 __asCode()

```
string ComputedExpression::__asCode ( ) const [virtual], [inherited]
```

Output the contents of the [ComputedExpression](#) as a string similar to how it would be represented as code.

Returns

A code-string representation of the computed expression.

Reimplemented in [Tang::ComputedExpressionString](#).

5.32.3.3 __assign_index()

```
GarbageCollected ComputedExpressionArray::__assign_index (
    const GarbageCollected & index,
    const GarbageCollected & value ) [override], [virtual]
```

Perform an index assignment to the supplied value.

Parameters

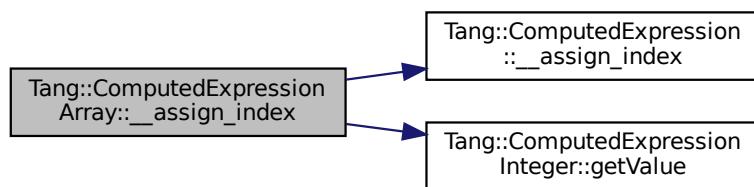
<i>index</i>	The index to which the value should be applied.
<i>value</i>	The value to store.

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.32.3.4 __boolean()

```
GarbageCollected ComputedExpression::__boolean ( ) const [virtual], [inherited]
```

Perform a type cast to boolean.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.32.3.5 __divide()

```
GarbageCollected ComputedExpression::__divide (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of dividing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to divide this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.32.3.6 __equal()

```
GarbageCollected ComputedExpression::__equal (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Perform an equality test.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionNativeLibraryFunction](#), [Tang::ComputedExpressionNativeBoundFunction](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), [Tang::ComputedExpressionCompiledFunction](#), and [Tang::ComputedExpressionBoolean](#).

5.32.3.7 __float()

`GarbageCollected ComputedExpression::__float () const [virtual], [inherited]`

Perform a type cast to float.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.32.3.8 __getIterator()

`GarbageCollected ComputedExpressionArray::__getIterator (`
`const GarbageCollected & collection) const [override], [virtual]`

Get an iterator for the expression.

Parameters

<code>collection</code>	The GarbageCollected value that will serve as the collection through which to iterate.
-------------------------	--

Reimplemented from [Tang::ComputedExpression](#).

5.32.3.9 __index()

`GarbageCollected ComputedExpressionArray::__index (`
`const GarbageCollected & index) const [override], [virtual]`

Perform an index operation.

Parameters

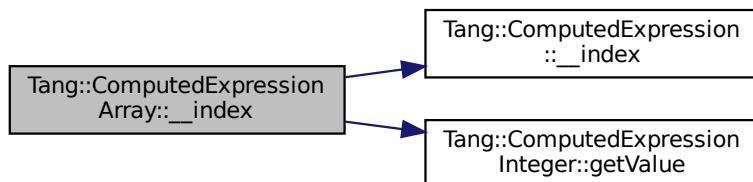
<code>index</code>	The index expression provided by the script.
--------------------	--

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:

**5.32.3.10 __integer()**

[GarbageCollected](#) `ComputedExpression::__integer () const [virtual], [inherited]`

Perform a type cast to integer.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.32.3.11 __iteratorNext()

[GarbageCollected](#) `ComputedExpressionArray::__iteratorNext (size_t index) const [override], [virtual]`

Get the next iterative value.

Parameters

<i>index</i>	The desired index value.
--------------	--------------------------

Reimplemented from [Tang::ComputedExpression](#).

5.32.3.12 __lessThan()

```
GarbageCollected ComputedExpression::__lessThan (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the "less than" comparison.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.32.3.13 __modulo()

```
GarbageCollected ComputedExpression::__modulo (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of moduloing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to modulo this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

5.32.3.14 __multiply()

```
GarbageCollected ComputedExpression::__multiply (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of multiplying this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to multiply to this.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.32.3.15 `__negative()`

```
GarbageCollected ComputedExpression::__negative () const [virtual], [inherited]
```

Compute the result of negating this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.32.3.16 `__not()`

```
GarbageCollected ComputedExpression::__not () const [virtual], [inherited]
```

Compute the logical not of this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.32.3.17 `__period()`

```
GarbageCollected ComputedExpression::__period (
    const GarbageCollected & member,
    std::shared_ptr< TangBase > & tang ) const [virtual], [inherited]
```

Perform a member access (period) operation.

Parameters

<i>member</i>	The member expression provided by the script.
---------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionLibrary](#).

5.32.3.18 `__slice()`

```
GarbageCollected ComputedExpressionArray::__slice (
    const GarbageCollected & begin,
    const GarbageCollected & end,
    const GarbageCollected & skip ) const [override], [virtual]
```

Perform a slice operation.

Convention will follow Python semantics, in which a slice will start at the provided index position, and go up to but not including the end index. The slice will default to an index increment of 1, but can be defined as another integer value.

Parameters

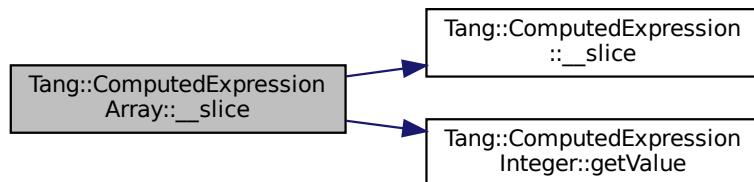
<code>begin</code>	The begin index expression provided by the script.
<code>end</code>	The end index expression provided by the script.
<code>skip</code>	The skip index expression provided by the script.

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.32.3.19 `__string()`

```
GarbageCollected ComputedExpressionArray::__string ( ) const [override], [virtual]
```

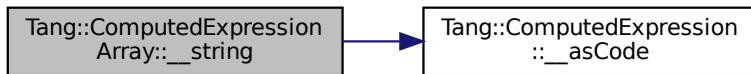
Perform a type cast to string.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.32.3.20 `__subtract()`

```
GarbageCollected ComputedExpression::__subtract (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of subtracting this value and the supplied value.

Parameters

<code>rhs</code>	The GarbageCollected value to subtract from this.
------------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.32.3.21 `append()`

```
void ComputedExpressionArray::append (
    const Tang::GarbageCollected & item )
```

Append an item to the contents of this array object.

Parameters

<i>item</i>	The value to append to the this array.
-------------	--

5.32.3.22 dump()

```
string ComputedExpressionArray::dump ( ) const [override], [virtual]
```

Output the contents of the [ComputedExpression](#) as a string.

Returns

A string representation of the computed expression.

Reimplemented from [Tang::ComputedExpression](#).

5.32.3.23 getContents()

```
const std::vector< Tang::GarbageCollected > & ComputedExpressionArray::getContents ( ) const
```

Return the contents of this object.

Returns

The contents of this object.

5.32.3.24 getMethods()

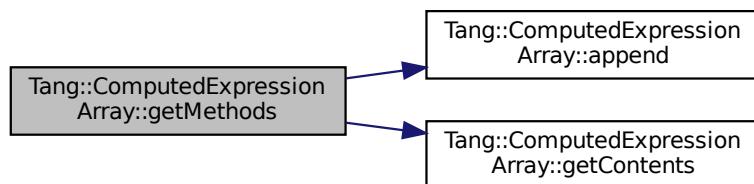
```
NativeBoundFunctionMap ComputedExpressionArray::getMethods ( ) [static]
```

Return the member functions implemented for this particular expression type.

Returns

The member functions implemented.

Here is the call graph for this function:



5.32.3.25 `is_equal()` [1/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const bool & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionBoolean](#).

5.32.3.26 `is_equal()` [2/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Error & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionError](#).

5.32.3.27 `is_equal()` [3/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::nullptr_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

5.32.3.28 is_equal() [4/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::string & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#).

5.32.3.29 is_equal() [5/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::float_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.32.3.30 is_equal() [6/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::integer_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.32.3.31 isCopyNeeded()

```
bool ComputedExpressionArray::isCopyNeeded ( ) const [override], [virtual]
```

Determine whether or not a copy is needed.

Copying is only required for ComputedExpressions which serve as containers, such as [ComputedExpressionArray](#) and [ComputedExpressionObject](#).

Returns

Whether or not a copy is needed.

Reimplemented from [Tang::ComputedExpression](#).

5.32.3.32 makeCopy()

```
GarbageCollected ComputedExpressionArray::makeCopy ( ) const [override], [virtual]
```

Make a copy of the [ComputedExpression](#) (recursively, if appropriate).

Returns

A [Tang::GarbageCollected](#) value for the new [ComputedExpression](#).

Reimplemented from [Tang::ComputedExpression](#).

The documentation for this class was generated from the following files:

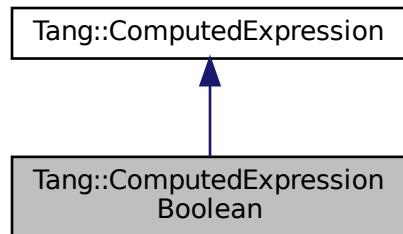
- [include/computedExpressionArray.hpp](#)
- [src/computedExpressionArray.cpp](#)

5.33 Tang::ComputedExpressionBoolean Class Reference

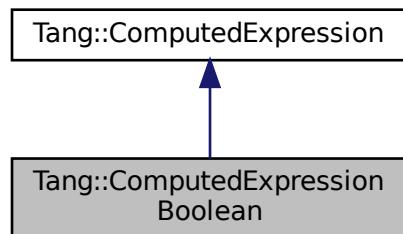
Represents an Boolean that is the result of a computation.

```
#include <computedExpressionBoolean.hpp>
```

Inheritance diagram for Tang::ComputedExpressionBoolean:



Collaboration diagram for Tang::ComputedExpressionBoolean:



Public Member Functions

- [ComputedExpressionBoolean \(bool val\)](#)
Construct an Boolean result.
- virtual std::string [dump \(\) const override](#)
Output the contents of the [ComputedExpression](#) as a string.
- [GarbageCollected makeCopy \(\) const override](#)
Make a copy of the [ComputedExpression](#) (recursively, if appropriate).
- virtual bool [is_equal \(const bool &val\) const override](#)
Check whether or not the computed expression is equal to another value.
- virtual [GarbageCollected __not \(\) const override](#)
Compute the logical not of this value.

- virtual `GarbageCollected __equal` (const `GarbageCollected &rhs`) const override
Perform an equality test.
- virtual `GarbageCollected __integer` () const override
Perform a type cast to integer.
- virtual `GarbageCollected __float` () const override
Perform a type cast to float.
- virtual `GarbageCollected __boolean` () const override
Perform a type cast to boolean.
- virtual `std::string __asCode` () const
Output the contents of the `ComputedExpression` as a string similar to how it would be represented as code.
- virtual `bool isCopyNeeded` () const
Determine whether or not a copy is needed.
- virtual `bool is_equal` (const `Tang::integer_t &val`) const
Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal` (const `Tang::float_t &val`) const
Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal` (const `std::string &val`) const
Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal` (const `Error &val`) const
Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal` (const `std::nullptr_t &val`) const
Check whether or not the computed expression is equal to another value.
- virtual `GarbageCollected __assign_index` (const `GarbageCollected &index`, const `GarbageCollected &value`)
Perform an index assignment to the supplied value.
- virtual `GarbageCollected __add` (const `GarbageCollected &rhs`) const
Compute the result of adding this value and the supplied value.
- virtual `GarbageCollected __subtract` (const `GarbageCollected &rhs`) const
Compute the result of subtracting this value and the supplied value.
- virtual `GarbageCollected __multiply` (const `GarbageCollected &rhs`) const
Compute the result of multiplying this value and the supplied value.
- virtual `GarbageCollected __divide` (const `GarbageCollected &rhs`) const
Compute the result of dividing this value and the supplied value.
- virtual `GarbageCollected __modulo` (const `GarbageCollected &rhs`) const
Compute the result of moduloing this value and the supplied value.
- virtual `GarbageCollected __negative` () const
Compute the result of negating this value.
- virtual `GarbageCollected __lessThan` (const `GarbageCollected &rhs`) const
Compute the "less than" comparison.
- virtual `GarbageCollected __period` (const `GarbageCollected &member`, `std::shared_ptr<TangBase> &tang`) const
Perform a member access (period) operation.
- virtual `GarbageCollected __index` (const `GarbageCollected &index`) const
Perform an index operation.
- virtual `GarbageCollected __slice` (const `GarbageCollected &begin`, const `GarbageCollected &end`, const `GarbageCollected &skip`) const
Perform a slice operation.
- virtual `GarbageCollected __getIterator` (const `GarbageCollected &collection`) const
Get an iterator for the expression.
- virtual `GarbageCollected __iteratorNext` (`size_t index=0`) const
Get the next iterative value.
- virtual `GarbageCollected __string` () const
Perform a type cast to string.

Private Attributes

- bool `val`
The boolean value.

5.33.1 Detailed Description

Represents an Boolean that is the result of a computation.

5.33.2 Constructor & Destructor Documentation

5.33.2.1 ComputedExpressionBoolean()

```
ComputedExpressionBoolean::ComputedExpressionBoolean (   
    bool val )
```

Construct an Boolean result.

Parameters

<code>val</code>	The boolean value.
------------------	--------------------

5.33.3 Member Function Documentation

5.33.3.1 __add()

```
GarbageCollected ComputedExpression::__add (   
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of adding this value and the supplied value.

Parameters

<code>rhs</code>	The <code>GarbageCollected</code> value to add to this.
------------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.33.3.2 __asCode()

```
string ComputedExpression::__asCode ( ) const [virtual], [inherited]
```

Output the contents of the [ComputedExpression](#) as a string similar to how it would be represented as code.

Returns

A code-string representation of the computed expression.

Reimplemented in [Tang::ComputedExpressionString](#).

5.33.3.3 __assign_index()

```
GarbageCollected ComputedExpression::__assign_index (
    const GarbageCollected & index,
    const GarbageCollected & value ) [virtual], [inherited]
```

Perform an index assignment to the supplied value.

Parameters

<i>index</i>	The index to which the value should be applied.
<i>value</i>	The value to store.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.33.3.4 __boolean()

```
GarbageCollected ComputedExpressionBoolean::__boolean ( ) const [override], [virtual]
```

Perform a type cast to boolean.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.33.3.5 __divide()

```
GarbageCollected ComputedExpression::__divide (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of dividing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to divide this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.33.3.6 __equal()

```
GarbageCollected ComputedExpressionBoolean::__equal (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Perform an equality test.

Parameters

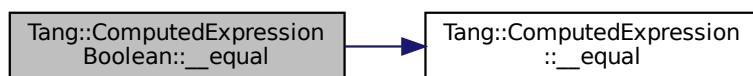
<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:

**5.33.3.7 __float()**

```
GarbageCollected ComputedExpressionBoolean::__float () const [override], [virtual]
```

Perform a type cast to float.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.33.3.8 __getIterator()

```
GarbageCollected ComputedExpression::__getIterator (
    const GarbageCollected & collection ) const [virtual], [inherited]
```

Get an iterator for the expression.

Parameters

<i>collection</i>	The GarbageCollected value that will serve as the collection through which to iterate.
-------------------	--

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.33.3.9 __index()

```
GarbageCollected ComputedExpression::__index (
    const GarbageCollected & index ) const [virtual], [inherited]
```

Perform an index operation.

Parameters

<i>index</i>	The index expression provided by the script.
--------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.33.3.10 __integer()

```
GarbageCollected ComputedExpressionBoolean::__integer () const [override], [virtual]
```

Perform a type cast to integer.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.33.3.11 __iteratorNext()

```
GarbageCollected ComputedExpression::__iteratorNext (
    size_t index = 0 ) const [virtual], [inherited]
```

Get the next iterative value.

Parameters

<i>index</i>	The desired index value.
--------------	--------------------------

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIterator](#), and [Tang::ComputedExpressionArray](#).

5.33.3.12 __lessThan()

```
GarbageCollected ComputedExpression::__lessThan (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the "less than" comparison.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.33.3.13 __modulo()

```
GarbageCollected ComputedExpression::__modulo (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of moduloing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to modulo this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

5.33.3.14 `__multiply()`

```
GarbageCollected ComputedExpression::__multiply (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of multiplying this value and the supplied value.

Returns

<code>rhs</code>	The <code>GarbageCollected</code> value to multiply to this.
------------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.33.3.15 `__negative()`

```
GarbageCollected ComputedExpression::__negative () const [virtual], [inherited]
```

Compute the result of negating this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.33.3.16 `__not()`

```
GarbageCollected ComputedExpressionBoolean::__not () const [override], [virtual]
```

Compute the logical not of this value.

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.33.3.17 `__period()`

```
GarbageCollected ComputedExpression::__period (
    const GarbageCollected & member,
    std::shared_ptr< TangBase > & tang ) const [virtual], [inherited]
```

Perform a member access (period) operation.

Parameters

<i>member</i>	The member expression provided by the script.
---------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionLibrary](#).

5.33.3.18 __slice()

```
GarbageCollected ComputedExpression::__slice (
    const GarbageCollected & begin,
    const GarbageCollected & end,
    const GarbageCollected & skip ) const [virtual], [inherited]
```

Perform a slice operation.

Convention will follow Python semantics, in which a slice will start at the provided index position, and go up to but not including the end index. The slice will default to an index increment of 1, but can be defined as another integer value.

Parameters

<i>begin</i>	The begin index expression provided by the script.
<i>end</i>	The end index expression provided by the script.
<i>skip</i>	The skip index expression provided by the script.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), and [Tang::ComputedExpressionArray](#).

5.33.3.19 __string()

```
GarbageCollected ComputedExpression::__string ( ) const [virtual], [inherited]
```

Perform a type cast to string.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIteratorEnd](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionArray](#).

5.33.3.20 `__subtract()`

```
GarbageCollected ComputedExpression::__subtract (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of subtracting this value and the supplied value.

Parameters

<i>rhs</i>	The <code>GarbageCollected</code> value to subtract from this.
------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.33.3.21 `dump()`

```
string ComputedExpressionBoolean::dump ( ) const [override], [virtual]
```

Output the contents of the `ComputedExpression` as a string.

Returns

A string representation of the computed expression.

Reimplemented from [Tang::ComputedExpression](#).

5.33.3.22 `is_equal()` [1/6]

```
bool ComputedExpressionBoolean::is_equal (
    const bool & val ) const [override], [virtual]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented from [Tang::ComputedExpression](#).

5.33.3.23 `is_equal()` [2/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Error & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionError](#).

5.33.3.24 `is_equal()` [3/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::nullptr_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

5.33.3.25 `is_equal()` [4/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::string & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#).

5.33.3.26 is_equal() [5/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::float_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.33.3.27 is_equal() [6/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::integer_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.33.3.28 isCopyNeeded()

```
bool ComputedExpression::isCopyNeeded ( ) const [virtual], [inherited]
```

Determine whether or not a copy is needed.

Copying is only required for ComputedExpressions which serve as containers, such as [ComputedExpressionArray](#) and [ComputedExpressionObject](#).

Returns

Whether or not a copy is needed.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.33.3.29 makeCopy()

[GarbageCollected](#) ComputedExpressionBoolean::makeCopy () const [override], [virtual]

Make a copy of the [ComputedExpression](#) (recursively, if appropriate).

Returns

A [Tang::GarbageCollected](#) value for the new [ComputedExpression](#).

Reimplemented from [Tang::ComputedExpression](#).

The documentation for this class was generated from the following files:

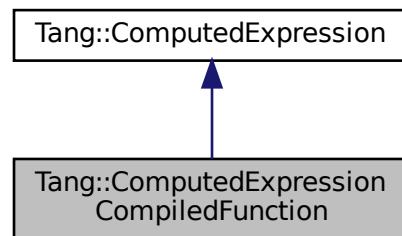
- include/computedExpressionBoolean.hpp
- src/computedExpressionBoolean.cpp

5.34 Tang::ComputedExpressionCompiledFunction Class Reference

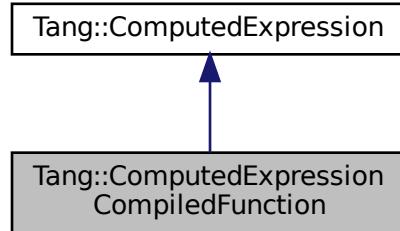
Represents a Compiled Function declared in the script.

```
#include <computedExpressionCompiledFunction.hpp>
```

Inheritance diagram for Tang::ComputedExpressionCompiledFunction:



Collaboration diagram for Tang::ComputedExpressionCompiledFunction:



Public Member Functions

- [ComputedExpressionCompiledFunction \(uint32_t argc, Tang::integer_t pc\)](#)
Construct an CompiledFunction.
- virtual std::string [dump \(\) const override](#)
Output the contents of the [ComputedExpression](#) as a string.
- [GarbageCollected makeCopy \(\) const override](#)
Make a copy of the [ComputedExpression](#) (recursively, if appropriate).
- virtual [GarbageCollected __equal \(const GarbageCollected &rhs\) const override](#)
Perform an equality test.
- uint32_t [getArgc \(\) const](#)
Get the argc value.
- Tang::integer_t [getPc \(\) const](#)
Get the bytecode target.
- virtual std::string [__asCode \(\) const](#)
Output the contents of the [ComputedExpression](#) as a string similar to how it would be represented as code.
- virtual bool [isCopyNeeded \(\) const](#)
Determine whether or not a copy is needed.
- virtual bool [is_equal \(const Tang::integer_t &val\) const](#)
Check whether or not the computed expression is equal to another value.
- virtual bool [is_equal \(const Tang::float_t &val\) const](#)
Check whether or not the computed expression is equal to another value.
- virtual bool [is_equal \(const bool &val\) const](#)
Check whether or not the computed expression is equal to another value.
- virtual bool [is_equal \(const std::string &val\) const](#)
Check whether or not the computed expression is equal to another value.
- virtual bool [is_equal \(const Error &val\) const](#)
Check whether or not the computed expression is equal to another value.
- virtual bool [is_equal \(const std::nullptr_t &val\) const](#)
Check whether or not the computed expression is equal to another value.
- virtual [GarbageCollected __assign_index \(const GarbageCollected &index, const GarbageCollected &value\) const](#)
Perform an index assignment to the supplied value.
- virtual [GarbageCollected __add \(const GarbageCollected &rhs\) const](#)
Compute the result of adding this value and the supplied value.

- virtual `GarbageCollected __subtract` (const `GarbageCollected &rhs`) const
Compute the result of subtracting this value and the supplied value.
- virtual `GarbageCollected __multiply` (const `GarbageCollected &rhs`) const
Compute the result of multiplying this value and the supplied value.
- virtual `GarbageCollected __divide` (const `GarbageCollected &rhs`) const
Compute the result of dividing this value and the supplied value.
- virtual `GarbageCollected __modulo` (const `GarbageCollected &rhs`) const
Compute the result of moduloing this value and the supplied value.
- virtual `GarbageCollected __negative` () const
Compute the result of negating this value.
- virtual `GarbageCollected __not` () const
Compute the logical not of this value.
- virtual `GarbageCollected __lessThan` (const `GarbageCollected &rhs`) const
Compute the "less than" comparison.
- virtual `GarbageCollected __period` (const `GarbageCollected &member`, std::shared_ptr<`TangBase`> &tang) const
Perform a member access (period) operation.
- virtual `GarbageCollected __index` (const `GarbageCollected &index`) const
Perform an index operation.
- virtual `GarbageCollected __slice` (const `GarbageCollected &begin`, const `GarbageCollected &end`, const `GarbageCollected &skip`) const
Perform a slice operation.
- virtual `GarbageCollected __getIterator` (const `GarbageCollected &collection`) const
Get an iterator for the expression.
- virtual `GarbageCollected __iteratorNext` (size_t index=0) const
Get the next iterative value.
- virtual `GarbageCollected __integer` () const
Perform a type cast to integer.
- virtual `GarbageCollected __float` () const
Perform a type cast to float.
- virtual `GarbageCollected __boolean` () const
Perform a type cast to boolean.
- virtual `GarbageCollected __string` () const
Perform a type cast to string.

Private Attributes

- `uint32_t argc`
The count of arguments that this function expects.
- `Tang::integer_t pc`
The bytecode address of the start of the function.

5.34.1 Detailed Description

Represents a Compiled Function declared in the script.

5.34.2 Constructor & Destructor Documentation

5.34.2.1 ComputedExpressionCompiledFunction()

```
ComputedExpressionCompiledFunction::ComputedExpressionCompiledFunction (
    uint32_t argc,
    Tang::integer_t pc )
```

Construct an CompiledFunction.

Parameters

<i>argc</i>	The count of arguments that this function expects.
<i>pc</i>	The bytecode address of the start of the function.

5.34.3 Member Function Documentation

5.34.3.1 __add()

```
GarbageCollected ComputedExpression::__add (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of adding this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to add to this.
------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.34.3.2 __asCode()

```
string ComputedExpression::__asCode ( ) const [virtual], [inherited]
```

Output the contents of the [ComputedExpression](#) as a string similar to how it would be represented as code.

Returns

A code-string representation of the computed expression.

Reimplemented in [Tang::ComputedExpressionString](#).

5.34.3.3 __assign_index()

```
GarbageCollected ComputedExpression::__assign_index (
    const GarbageCollected & index,
    const GarbageCollected & value ) [virtual], [inherited]
```

Perform an index assignment to the supplied value.

Parameters

<i>index</i>	The index to which the value should be applied.
<i>value</i>	The value to store.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.34.3.4 __boolean()

```
GarbageCollected ComputedExpression::__boolean () const [virtual], [inherited]
```

Perform a type cast to boolean.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.34.3.5 __divide()

```
GarbageCollected ComputedExpression::__divide (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of dividing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to divide this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.34.3.6 __equal()

```
GarbageCollected ComputedExpressionCompiledFunction::__equal (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Perform an equality test.

Parameters

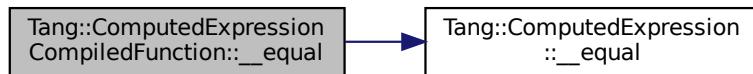
<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:

**5.34.3.7 __float()**

```
GarbageCollected ComputedExpression::__float () const [virtual], [inherited]
```

Perform a type cast to float.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.34.3.8 __getIterator()

```
GarbageCollected ComputedExpression::__getIterator (
    const GarbageCollected & collection ) const [virtual], [inherited]
```

Get an iterator for the expression.

Parameters

<i>collection</i>	The GarbageCollected value that will serve as the collection through which to iterate.
-------------------	--

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.34.3.9 __index()

```
GarbageCollected ComputedExpression::__index (
    const GarbageCollected & index ) const [virtual], [inherited]
```

Perform an index operation.

Parameters

<i>index</i>	The index expression provided by the script.
--------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.34.3.10 __integer()

```
GarbageCollected ComputedExpression::__integer () const [virtual], [inherited]
```

Perform a type cast to integer.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.34.3.11 __iteratorNext()

```
GarbageCollected ComputedExpression::__iteratorNext (
    size_t index = 0 ) const [virtual], [inherited]
```

Get the next iterative value.

Parameters

<i>index</i>	The desired index value.
--------------	--------------------------

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIterator](#), and [Tang::ComputedExpressionArray](#).

5.34.3.12 __lessThan()

```
GarbageCollected ComputedExpression::__lessThan (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the "less than" comparison.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.34.3.13 __modulo()

```
GarbageCollected ComputedExpression::__modulo (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of moduloing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to modulo this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

5.34.3.14 `__multiply()`

```
GarbageCollected ComputedExpression::__multiply (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of multiplying this value and the supplied value.

Parameters

<code>rhs</code>	The <code>GarbageCollected</code> value to multiply to this.
------------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.34.3.15 `__negative()`

```
GarbageCollected ComputedExpression::__negative () const [virtual], [inherited]
```

Compute the result of negating this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.34.3.16 `__not()`

```
GarbageCollected ComputedExpression::__not () const [virtual], [inherited]
```

Compute the logical not of this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.34.3.17 `__period()`

```
GarbageCollected ComputedExpression::__period (
    const GarbageCollected & member,
    std::shared_ptr< TangBase > & tang ) const [virtual], [inherited]
```

Perform a member access (period) operation.

Parameters

<i>member</i>	The member expression provided by the script.
---------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionLibrary](#).

5.34.3.18 __slice()

```
GarbageCollected ComputedExpression::__slice (
    const GarbageCollected & begin,
    const GarbageCollected & end,
    const GarbageCollected & skip ) const [virtual], [inherited]
```

Perform a slice operation.

Convention will follow Python semantics, in which a slice will start at the provided index position, and go up to but not including the end index. The slice will default to an index increment of 1, but can be defined as another integer value.

Parameters

<i>begin</i>	The begin index expression provided by the script.
<i>end</i>	The end index expression provided by the script.
<i>skip</i>	The skip index expression provided by the script.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), and [Tang::ComputedExpressionArray](#).

5.34.3.19 __string()

```
GarbageCollected ComputedExpression::__string ( ) const [virtual], [inherited]
```

Perform a type cast to string.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIteratorEnd](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionArray](#).

5.34.3.20 `__subtract()`

```
GarbageCollected ComputedExpression::__subtract (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of subtracting this value and the supplied value.

Parameters

<i>rhs</i>	The <code>GarbageCollected</code> value to subtract from this.
------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.34.3.21 `dump()`

```
string ComputedExpressionCompiledFunction::dump () const [override], [virtual]
```

Output the contents of the `ComputedExpression` as a string.

Returns

A string representation of the computed expression.

Reimplemented from [Tang::ComputedExpression](#).

5.34.3.22 `is_equal()` [1/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const bool & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionBoolean](#).

5.34.3.23 `is_equal()` [2/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Error & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionError](#).

5.34.3.24 `is_equal()` [3/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::nullptr_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

5.34.3.25 `is_equal()` [4/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::string & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#).

5.34.3.26 is_equal() [5/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::float_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.34.3.27 is_equal() [6/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::integer_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.34.3.28 isCopyNeeded()

```
bool ComputedExpression::isCopyNeeded ( ) const [virtual], [inherited]
```

Determine whether or not a copy is needed.

Copying is only required for `ComputedExpressions` which serve as containers, such as `ComputedExpressionArray` and `ComputedExpressionObject`.

Returns

Whether or not a copy is needed.

Reimplemented in `Tang::ComputedExpressionMap`, and `Tang::ComputedExpressionArray`.

5.34.3.29 `makeCopy()`

`GarbageCollected` `ComputedExpressionCompiledFunction::makeCopy () const [override], [virtual]`

Make a copy of the `ComputedExpression` (recursively, if appropriate).

Returns

A `Tang::GarbageCollected` value for the new `ComputedExpression`.

Reimplemented from `Tang::ComputedExpression`.

The documentation for this class was generated from the following files:

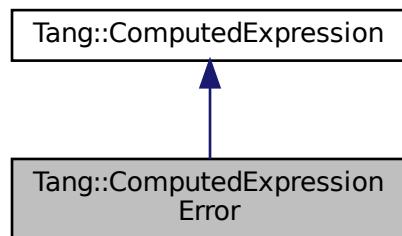
- include/computedExpressionCompiledFunction.hpp
- src/computedExpressionCompiledFunction.cpp

5.35 Tang::ComputedExpressionError Class Reference

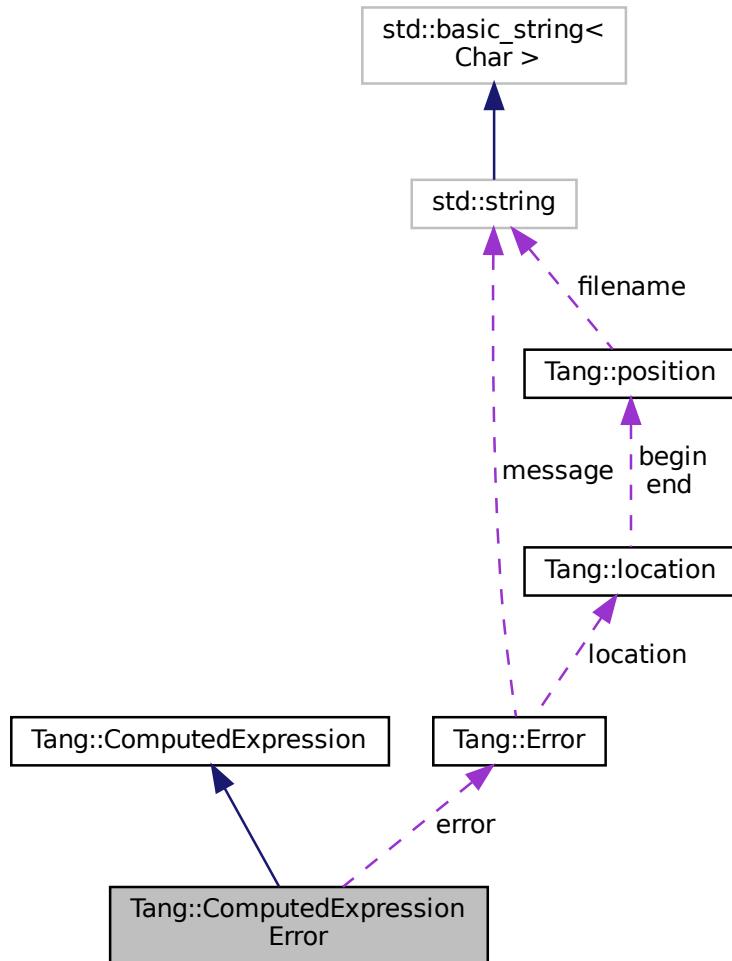
Represents a Runtime `Error`.

```
#include <computedExpressionError.hpp>
```

Inheritance diagram for `Tang::ComputedExpressionError`:



Collaboration diagram for Tang::ComputedExpressionError:



Public Member Functions

- [ComputedExpressionError \(Tang::Error error\)](#)
Construct a Runtime Error.
- virtual std::string [dump \(\) const override](#)
Output the contents of the `ComputedExpression` as a string.
- [GarbageCollected makeCopy \(\) const override](#)
Make a copy of the `ComputedExpression` (recursively, if appropriate).
- virtual bool [is_equal \(const Error &val\) const override](#)
Check whether or not the computed expression is equal to another value.
- virtual [GarbageCollected __add \(const GarbageCollected &rhs\) const override](#)
Compute the result of adding this value and the supplied value.
- virtual [GarbageCollected __subtract \(const GarbageCollected &rhs\) const override](#)
Compute the result of subtracting this value and the supplied value.
- virtual [GarbageCollected __multiply \(const GarbageCollected &rhs\) const override](#)

- virtual `GarbageCollected __divide` (const `GarbageCollected &rhs`) const override

Compute the result of dividing this value and the supplied value.
- virtual `GarbageCollected __modulo` (const `GarbageCollected &rhs`) const override

Compute the result of moduloing this value and the supplied value.
- virtual `GarbageCollected __negative` () const override

Compute the result of negating this value.
- virtual `GarbageCollected __not` () const override

Compute the logical not of this value.
- virtual `GarbageCollected __lessThan` (const `GarbageCollected &rhs`) const override

Compute the "less than" comparison.
- virtual `GarbageCollected __equal` (const `GarbageCollected &rhs`) const override

Perform an equality test.
- virtual `GarbageCollected __integer` () const override

Perform a type cast to integer.
- virtual `GarbageCollected __float` () const override

Perform a type cast to float.
- virtual `GarbageCollected __boolean` () const override

Perform a type cast to boolean.
- virtual `GarbageCollected __string` () const override

Perform a type cast to string.
- virtual `std::string __asCode` () const

Output the contents of the `ComputedExpression` as a string similar to how it would be represented as code.
- virtual `bool isCopyNeeded` () const

Determine whether or not a copy is needed.
- virtual `bool is_equal` (const `Tang::integer_t &val`) const

Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal` (const `Tang::float_t &val`) const

Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal` (const `bool &val`) const

Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal` (const `std::string &val`) const

Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal` (const `std::nullptr_t &val`) const

Check whether or not the computed expression is equal to another value.
- virtual `GarbageCollected __assign_index` (const `GarbageCollected &index`, const `GarbageCollected &value`)

Perform an index assignment to the supplied value.
- virtual `GarbageCollected __period` (const `GarbageCollected &member`, `std::shared_ptr<TangBase> &tang`) const

Perform a member access (period) operation.
- virtual `GarbageCollected __index` (const `GarbageCollected &index`) const

Perform an index operation.
- virtual `GarbageCollected __slice` (const `GarbageCollected &begin`, const `GarbageCollected &end`, const `GarbageCollected &skip`) const

Perform a slice operation.
- virtual `GarbageCollected __getIterator` (const `GarbageCollected &collection`) const

Get an iterator for the expression.
- virtual `GarbageCollected __iteratorNext` (`size_t index=0`) const

Get the next iterative value.

Private Attributes

- `Tang::Error error`

The `Error` object.

5.35.1 Detailed Description

Represents a Runtime [Error](#).

5.35.2 Constructor & Destructor Documentation

5.35.2.1 ComputedExpressionError()

```
ComputedExpressionError::ComputedExpressionError (
    Tang::Error error )
```

Construct a Runtime [Error](#).

Parameters

<code>error</code>	The <code>Tang::Error</code> object.
--------------------	--------------------------------------

5.35.3 Member Function Documentation

5.35.3.1 __add()

```
GarbageCollected ComputedExpressionError::__add (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the result of adding this value and the supplied value.

Parameters

<code>rhs</code>	The <code>GarbageCollected</code> value to add to this.
------------------	---

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.35.3.2 __asCode()

```
string ComputedExpression::__asCode ( ) const [virtual], [inherited]
```

Output the contents of the [ComputedExpression](#) as a string similar to how it would be represented as code.

Returns

A code-string representation of the computed expression.

Reimplemented in [Tang::ComputedExpressionString](#).

5.35.3.3 __assign_index()

```
GarbageCollected ComputedExpression::__assign_index (
    const GarbageCollected & index,
    const GarbageCollected & value ) [virtual], [inherited]
```

Perform an index assignment to the supplied value.

Parameters

<i>index</i>	The index to which the value should be applied.
<i>value</i>	The value to store.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.35.3.4 __boolean()

```
GarbageCollected ComputedExpressionError::__boolean ( ) const [override], [virtual]
```

Perform a type cast to boolean.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.35.3.5 __divide()

```
GarbageCollected ComputedExpressionError::__divide (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the result of dividing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to divide this by.
------------	---

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.35.3.6 __equal()

```
GarbageCollected ComputedExpressionError::__equal (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Perform an equality test.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.35.3.7 __float()

```
GarbageCollected ComputedExpressionError::__float ( ) const [override], [virtual]
```

Perform a type cast to float.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.35.3.8 __getIterator()

```
GarbageCollected ComputedExpression::__getIterator (
    const GarbageCollected & collection ) const [virtual], [inherited]
```

Get an iterator for the expression.

Parameters

<i>collection</i>	The GarbageCollected value that will serve as the collection through which to iterate.
-------------------	--

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.35.3.9 __index()

```
GarbageCollected ComputedExpression::__index (
    const GarbageCollected & index ) const [virtual], [inherited]
```

Perform an index operation.

Parameters

<i>index</i>	The index expression provided by the script.
--------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.35.3.10 __integer()

```
GarbageCollected ComputedExpressionError::__integer ( ) const [override], [virtual]
```

Perform a type cast to integer.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.35.3.11 __iteratorNext()

```
GarbageCollected ComputedExpression::__iteratorNext (
    size_t index = 0 ) const [virtual], [inherited]
```

Get the next iterative value.

Parameters

<i>index</i>	The desired index value.
--------------	--------------------------

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIterator](#), and [Tang::ComputedExpressionArray](#).

5.35.3.12 __lessThan()

```
GarbageCollected ComputedExpressionError::__lessThan (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the "less than" comparison.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.35.3.13 __modulo()

```
GarbageCollected ComputedExpressionError::__modulo (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the result of moduloing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to modulo this by.
------------	---

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.35.3.14 `__multiply()`

```
GarbageCollected ComputedExpressionError::__multiply (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the result of multiplying this value and the supplied value.

Returns

<code>rhs</code>	The <code>GarbageCollected</code> value to multiply to this.
------------------	--

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.35.3.15 `__negative()`

```
GarbageCollected ComputedExpressionError::__negative () const [override], [virtual]
```

Compute the result of negating this value.

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.35.3.16 `__not()`

```
GarbageCollected ComputedExpressionError::__not () const [override], [virtual]
```

Compute the logical not of this value.

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.35.3.17 `__period()`

```
GarbageCollected ComputedExpression::__period (
    const GarbageCollected & member,
    std::shared_ptr< TangBase > & tang ) const [virtual], [inherited]
```

Perform a member access (period) operation.

Parameters

<i>member</i>	The member expression provided by the script.
---------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionLibrary](#).

5.35.3.18 __slice()

```
GarbageCollected ComputedExpression::__slice (
    const GarbageCollected & begin,
    const GarbageCollected & end,
    const GarbageCollected & skip ) const [virtual], [inherited]
```

Perform a slice operation.

Convention will follow Python semantics, in which a slice will start at the provided index position, and go up to but not including the end index. The slice will default to an index increment of 1, but can be defined as another integer value.

Parameters

<i>begin</i>	The begin index expression provided by the script.
<i>end</i>	The end index expression provided by the script.
<i>skip</i>	The skip index expression provided by the script.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), and [Tang::ComputedExpressionArray](#).

5.35.3.19 __string()

```
GarbageCollected ComputedExpressionError::__string () const [override], [virtual]
```

Perform a type cast to string.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.35.3.20 `__subtract()`

```
GarbageCollected ComputedExpressionError::__subtract (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the result of subtracting this value and the supplied value.

Parameters

<i>rhs</i>	The <code>GarbageCollected</code> value to subtract from this.
------------	--

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.35.3.21 `dump()`

```
std::string ComputedExpressionError::dump () const [override], [virtual]
```

Output the contents of the `ComputedExpression` as a string.

Returns

A string representation of the computed expression.

Reimplemented from [Tang::ComputedExpression](#).

5.35.3.22 `is_equal()` [1/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const bool & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionBoolean](#).

5.35.3.23 is_equal() [2/6]

```
bool ComputedExpressionError::is_equal (
    const Error & val ) const [override], [virtual]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented from [Tang::ComputedExpression](#).

5.35.3.24 is_equal() [3/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::nullptr_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

5.35.3.25 is_equal() [4/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::string & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#).

5.35.3.26 is_equal() [5/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::float_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.35.3.27 is_equal() [6/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::integer_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.35.3.28 isCopyNeeded()

```
bool ComputedExpression::isCopyNeeded ( ) const [virtual], [inherited]
```

Determine whether or not a copy is needed.

Copying is only required for ComputedExpressions which serve as containers, such as [ComputedExpressionArray](#) and [ComputedExpressionObject](#).

Returns

Whether or not a copy is needed.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.35.3.29 makeCopy()

`GarbageCollected` [ComputedExpressionError](#)::makeCopy () const [override], [virtual]

Make a copy of the [ComputedExpression](#) (recursively, if appropriate).

Returns

A [Tang::GarbageCollected](#) value for the new [ComputedExpression](#).

Reimplemented from [Tang::ComputedExpression](#).

The documentation for this class was generated from the following files:

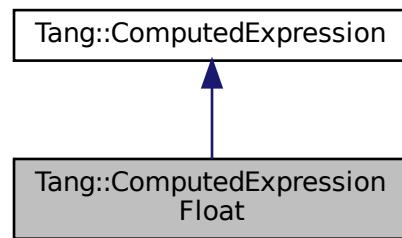
- [include/computedExpressionError.hpp](#)
- [src/computedExpressionError.cpp](#)

5.36 Tang::ComputedExpressionFloat Class Reference

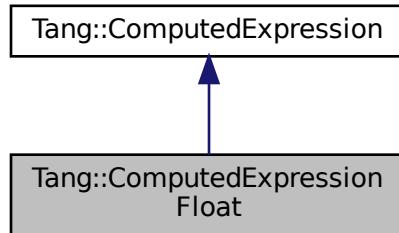
Represents a Float that is the result of a computation.

```
#include <computedExpressionFloat.hpp>
```

Inheritance diagram for Tang::ComputedExpressionFloat:



Collaboration diagram for Tang::ComputedExpressionFloat:



Public Member Functions

- **ComputedExpressionFloat (Tang::float_t val)**
Construct a Float result.
- virtual std::string **dump () const override**
Output the contents of the [ComputedExpression](#) as a string.
- **GarbageCollected makeCopy () const override**
Make a copy of the [ComputedExpression](#) (recursively, if appropriate).
- virtual bool **is_equal (const Tang::integer_t &val) const override**
Check whether or not the computed expression is equal to another value.
- virtual bool **is_equal (const Tang::float_t &val) const override**
Check whether or not the computed expression is equal to another value.
- virtual bool **is_equal (const bool &val) const override**
Check whether or not the computed expression is equal to another value.
- virtual **GarbageCollected __add (const GarbageCollected &rhs) const override**
Compute the result of adding this value and the supplied value.
- virtual **GarbageCollected __subtract (const GarbageCollected &rhs) const override**
Compute the result of subtracting this value and the supplied value.
- virtual **GarbageCollected __multiply (const GarbageCollected &rhs) const override**
Compute the result of multiplying this value and the supplied value.
- virtual **GarbageCollected __divide (const GarbageCollected &rhs) const override**
Compute the result of dividing this value and the supplied value.
- virtual **GarbageCollected __negative () const override**
Compute the result of negating this value.
- virtual **GarbageCollected __not () const override**
Compute the logical not of this value.
- virtual **GarbageCollected __lessThan (const GarbageCollected &rhs) const override**
Compute the "less than" comparison.
- virtual **GarbageCollected __equal (const GarbageCollected &rhs) const override**
Perform an equality test.
- virtual **GarbageCollected __integer () const override**
Perform a type cast to integer.
- virtual **GarbageCollected __float () const override**
Perform a type cast to float.

- virtual `GarbageCollected __boolean () const override`
Perform a type cast to boolean.
- virtual `GarbageCollected __string () const override`
Perform a type cast to string.
- `Tang::float_t getValue () const`
Helper function to get the value associated with this expression.
- virtual `std::string __asCode () const`
Output the contents of the `ComputedExpression` as a string similar to how it would be represented as code.
- virtual `bool isCopyNeeded () const`
Determine whether or not a copy is needed.
- virtual `bool is_equal (const std::string &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal (const Error &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal (const std::nullptr_t &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `GarbageCollected __assign_index (const GarbageCollected &index, const GarbageCollected &value)`
Perform an index assignment to the supplied value.
- virtual `GarbageCollected __modulo (const GarbageCollected &rhs) const`
Compute the result of moduloing this value and the supplied value.
- virtual `GarbageCollected __period (const GarbageCollected &member, std::shared_ptr< TangBase > &tang) const`
Perform a member access (period) operation.
- virtual `GarbageCollected __index (const GarbageCollected &index) const`
Perform an index operation.
- virtual `GarbageCollected __slice (const GarbageCollected &begin, const GarbageCollected &end, const GarbageCollected &skip) const`
Perform a slice operation.
- virtual `GarbageCollected __getIterator (const GarbageCollected &collection) const`
Get an iterator for the expression.
- virtual `GarbageCollected __iteratorNext (size_t index=0) const`
Get the next iterative value.

Private Attributes

- `Tang::float_t val`
The float value.

5.36.1 Detailed Description

Represents a Float that is the result of a computation.

5.36.2 Constructor & Destructor Documentation

5.36.2.1 ComputedExpressionFloat()

```
ComputedExpressionFloat::ComputedExpressionFloat (
    Tang::float_t val )
```

Construct a Float result.

Parameters

<i>val</i>	The float value.
------------	------------------

5.36.3 Member Function Documentation**5.36.3.1 __add()**

```
GarbageCollected ComputedExpressionFloat::__add (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the result of adding this value and the supplied value.

Parameters

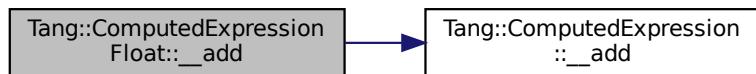
<i>rhs</i>	The GarbageCollected value to add to this.
------------	--

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:

**5.36.3.2 __asCode()**

```
string ComputedExpression::__asCode ( ) const [virtual], [inherited]
```

Output the contents of the [ComputedExpression](#) as a string similar to how it would be represented as code.

Returns

A code-string representation of the computed expression.

Reimplemented in [Tang::ComputedExpressionString](#).

5.36.3.3 __assign_index()

```
GarbageCollected ComputedExpression::__assign_index (
    const GarbageCollected & index,
    const GarbageCollected & value ) [virtual], [inherited]
```

Perform an index assignment to the supplied value.

Parameters

<i>index</i>	The index to which the value should be applied.
<i>value</i>	The value to store.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.36.3.4 __boolean()

```
GarbageCollected ComputedExpressionFloat::__boolean () const [override], [virtual]
```

Perform a type cast to boolean.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.36.3.5 __divide()

```
GarbageCollected ComputedExpressionFloat::__divide (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the result of dividing this value and the supplied value.

Parameters

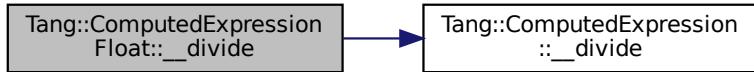
<i>rhs</i>	The GarbageCollected value to divide this by.
------------	---

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.36.3.6 __equal()

```
GarbageCollected ComputedExpressionFloat::__equal (\n    const GarbageCollected & rhs ) const [override], [virtual]
```

Perform an equality test.

Parameters

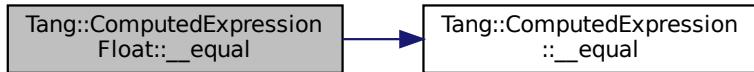
<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.36.3.7 __float()

```
GarbageCollected ComputedExpressionFloat::__float () const [override], [virtual]
```

Perform a type cast to float.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.36.3.8 __getIterator()

```
GarbageCollected ComputedExpression::__getIterator (
    const GarbageCollected & collection ) const [virtual], [inherited]
```

Get an iterator for the expression.

Parameters

<i>collection</i>	The GarbageCollected value that will serve as the collection through which to iterate.
-------------------	--

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.36.3.9 __index()

```
GarbageCollected ComputedExpression::__index (
    const GarbageCollected & index ) const [virtual], [inherited]
```

Perform an index operation.

Parameters

<i>index</i>	The index expression provided by the script.
--------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.36.3.10 __integer()

```
GarbageCollected ComputedExpressionFloat::__integer () const [override], [virtual]
```

Perform a type cast to integer.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.36.3.11 `__iteratorNext()`

```
GarbageCollected ComputedExpression::__iteratorNext (
    size_t index = 0 ) const [virtual], [inherited]
```

Get the next iterative value.

Parameters

<code>index</code>	The desired index value.
--------------------	--------------------------

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIterator](#), and [Tang::ComputedExpressionArray](#).

5.36.3.12 `__lessThan()`

```
GarbageCollected ComputedExpressionFloat::__lessThan (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the "less than" comparison.

Parameters

<code>rhs</code>	The GarbageCollected value to compare against.
------------------	--

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.36.3.13 `__modulo()`

```
GarbageCollected ComputedExpression::__modulo (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of moduloing this value and the supplied value.

Parameters

<code>rhs</code>	The GarbageCollected value to modulo this by.
------------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

5.36.3.14 `__multiply()`

```
GarbageCollected ComputedExpressionFloat::__multiply (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the result of multiplying this value and the supplied value.

Parameters

<code>rhs</code>	The GarbageCollected value to multiply to this.
------------------	---

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.36.3.15 `__negative()`

```
GarbageCollected ComputedExpressionFloat::__negative () const [override], [virtual]
```

Compute the result of negating this value.

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.36.3.16 __not()

```
GarbageCollected ComputedExpressionFloat::__not ( ) const [override], [virtual]
```

Compute the logical not of this value.

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.36.3.17 __period()

```
GarbageCollected ComputedExpression::__period (
    const GarbageCollected & member,
    std::shared_ptr< TangBase > & tang ) const [virtual], [inherited]
```

Perform a member access (period) operation.

Parameters

<i>member</i>	The member expression provided by the script.
---------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionLibrary](#).

5.36.3.18 __slice()

```
GarbageCollected ComputedExpression::__slice (
    const GarbageCollected & begin,
    const GarbageCollected & end,
    const GarbageCollected & skip ) const [virtual], [inherited]
```

Perform a slice operation.

Convention will follow Python semantics, in which a slice will start at the provided index position, and go up to but not including the end index. The slice will default to an index increment of 1, but can be defined as another integer value.

Parameters

<i>begin</i>	The begin index expression provided by the script.
<i>end</i>	The end index expression provided by the script.
<i>skip</i>	The skip index expression provided by the script.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), and [Tang::ComputedExpressionArray](#).

5.36.3.19 `__string()`

```
GarbageCollected ComputedExpressionFloat::__string ( ) const [override], [virtual]
```

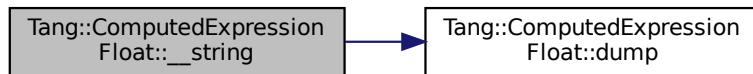
Perform a type cast to string.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.36.3.20 `__subtract()`

```
GarbageCollected ComputedExpressionFloat::__subtract ( \n    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the result of subtracting this value and the supplied value.

Parameters

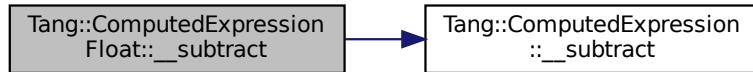
<i>rhs</i>	The GarbageCollected value to subtract from this.
------------	---

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.36.3.21 dump()

```
string ComputedExpressionFloat::dump ( ) const [override], [virtual]
```

Output the contents of the [ComputedExpression](#) as a string.

Returns

A string representation of the computed expression.

Reimplemented from [Tang::ComputedExpression](#).

5.36.3.22 getValue()

```
Tang::float_t ComputedExpressionFloat::getValue ( ) const
```

Helper function to get the value associated with this expression.

Returns

The value associated with this expression.

5.36.3.23 is_equal() [1/6]

```
bool ComputedExpressionFloat::is_equal (
    const bool & val ) const [override], [virtual]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented from [Tang::ComputedExpression](#).

5.36.3.24 is_equal() [2/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Error & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionError](#).

5.36.3.25 is_equal() [3/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::nullptr_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

5.36.3.26 is_equal() [4/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::string & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#).

5.36.3.27 is_equal() [5/6]

```
bool ComputedExpressionFloat::is_equal (
    const Tang::float_t & val ) const [override], [virtual]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented from [Tang::ComputedExpression](#).

5.36.3.28 is_equal() [6/6]

```
bool ComputedExpressionFloat::is_equal (
    const Tang::integer_t & val ) const [override], [virtual]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented from [Tang::ComputedExpression](#).

5.36.3.29 isCopyNeeded()

```
bool ComputedExpression::isCopyNeeded ( ) const [virtual], [inherited]
```

Determine whether or not a copy is needed.

Copying is only required for ComputedExpressions which serve as containers, such as [ComputedExpressionArray](#) and [ComputedExpressionObject](#).

Returns

Whether or not a copy is needed.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.36.3.30 makeCopy()

```
GarbageCollected ComputedExpressionFloat::makeCopy ( ) const [override], [virtual]
```

Make a copy of the [ComputedExpression](#) (recursively, if appropriate).

Returns

A [Tang::GarbageCollected](#) value for the new [ComputedExpression](#).

Reimplemented from [Tang::ComputedExpression](#).

The documentation for this class was generated from the following files:

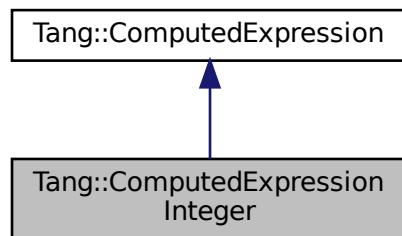
- [include/computedExpressionFloat.hpp](#)
- [src/computedExpressionFloat.cpp](#)

5.37 Tang::ComputedExpressionInteger Class Reference

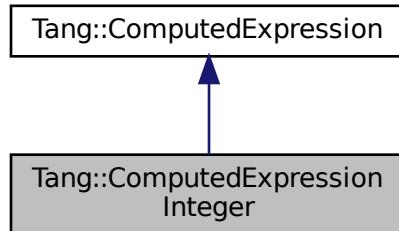
Represents an Integer that is the result of a computation.

```
#include <computedExpressionInteger.hpp>
```

Inheritance diagram for Tang::ComputedExpressionInteger:



Collaboration diagram for Tang::ComputedExpressionInteger:



Public Member Functions

- **ComputedExpressionInteger (Tang::integer_t val)**
Construct an Integer result.
- virtual std::string **dump () const override**
Output the contents of the [ComputedExpression](#) as a string.
- **GarbageCollected makeCopy () const override**
Make a copy of the [ComputedExpression](#) (recursively, if appropriate).
- virtual bool **is_equal (const Tang::integer_t &val) const override**
Check whether or not the computed expression is equal to another value.
- virtual bool **is_equal (const Tang::float_t &val) const override**
Check whether or not the computed expression is equal to another value.
- virtual bool **is_equal (const bool &val) const override**
Check whether or not the computed expression is equal to another value.
- virtual **GarbageCollected __add (const GarbageCollected &rhs) const override**
Compute the result of adding this value and the supplied value.
- virtual **GarbageCollected __subtract (const GarbageCollected &rhs) const override**
Compute the result of subtracting this value and the supplied value.
- virtual **GarbageCollected __multiply (const GarbageCollected &rhs) const override**
Compute the result of multiplying this value and the supplied value.
- virtual **GarbageCollected __divide (const GarbageCollected &rhs) const override**
Compute the result of dividing this value and the supplied value.
- virtual **GarbageCollected __modulo (const GarbageCollected &rhs) const override**
Compute the result of moduloing this value and the supplied value.
- virtual **GarbageCollected __negative () const override**
Compute the result of negating this value.
- virtual **GarbageCollected __not () const override**
Compute the logical not of this value.
- virtual **GarbageCollected __lessThan (const GarbageCollected &rhs) const override**
Compute the "less than" comparison.
- virtual **GarbageCollected __equal (const GarbageCollected &rhs) const override**
Perform an equality test.
- virtual **GarbageCollected __integer () const override**
Perform a type cast to integer.

- virtual `GarbageCollected __float () const override`
Perform a type cast to float.
- virtual `GarbageCollected __boolean () const override`
Perform a type cast to boolean.
- virtual `GarbageCollected __string () const override`
Perform a type cast to string.
- `Tang::integer_t getValue () const`
Helper function to get the value associated with this expression.
- virtual `std::string __asCode () const`
Output the contents of the `ComputedExpression` as a string similar to how it would be represented as code.
- virtual `bool isCopyNeeded () const`
Determine whether or not a copy is needed.
- virtual `bool is_equal (const std::string &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal (const Error &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal (const std::nullptr_t &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `GarbageCollected __assign_index (const GarbageCollected &index, const GarbageCollected &value)`
Perform an index assignment to the supplied value.
- virtual `GarbageCollected __period (const GarbageCollected &member, std::shared_ptr< TangBase > &tang)`
const
Perform a member access (period) operation.
- virtual `GarbageCollected __index (const GarbageCollected &index) const`
Perform an index operation.
- virtual `GarbageCollected __slice (const GarbageCollected &begin, const GarbageCollected &end, const GarbageCollected &skip)`
const
Perform a slice operation.
- virtual `GarbageCollected __getIterator (const GarbageCollected &collection) const`
Get an iterator for the expression.
- virtual `GarbageCollected __iteratorNext (size_t index=0) const`
Get the next iterative value.

Private Attributes

- `Tang::integer_t val`
The integer value.

5.37.1 Detailed Description

Represents an Integer that is the result of a computation.

5.37.2 Constructor & Destructor Documentation

5.37.2.1 ComputedExpressionInteger()

```
ComputedExpressionInteger::ComputedExpressionInteger (
    Tang::integer_t val )
```

Construct an Integer result.

Parameters

<i>val</i>	The integer value.
------------	--------------------

5.37.3 Member Function Documentation**5.37.3.1 __add()**

```
GarbageCollected ComputedExpressionInteger::__add (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the result of adding this value and the supplied value.

Parameters

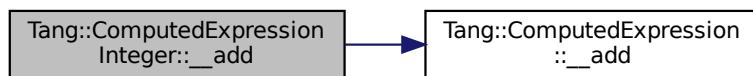
<i>rhs</i>	The GarbageCollected value to add to this.
------------	--

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:

**5.37.3.2 __asCode()**

```
string ComputedExpression::__asCode ( ) const [virtual], [inherited]
```

Output the contents of the [ComputedExpression](#) as a string similar to how it would be represented as code.

Returns

A code-string representation of the computed expression.

Reimplemented in [Tang::ComputedExpressionString](#).

5.37.3.3 __assign_index()

```
GarbageCollected ComputedExpression::__assign_index (
    const GarbageCollected & index,
    const GarbageCollected & value ) [virtual], [inherited]
```

Perform an index assignment to the supplied value.

Parameters

<i>index</i>	The index to which the value should be applied.
<i>value</i>	The value to store.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.37.3.4 __boolean()

```
GarbageCollected ComputedExpressionInteger::__boolean () const [override], [virtual]
```

Perform a type cast to boolean.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.37.3.5 __divide()

```
GarbageCollected ComputedExpressionInteger::__divide (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the result of dividing this value and the supplied value.

Parameters

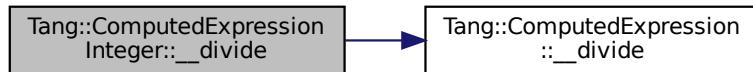
<i>rhs</i>	The GarbageCollected value to divide this by.
------------	---

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.37.3.6 __equal()

```
GarbageCollected ComputedExpressionInteger::__equal (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Perform an equality test.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.37.3.7 __float()

```
GarbageCollected ComputedExpressionInteger::__float () const [override], [virtual]
```

Perform a type cast to float.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.37.3.8 `__getIterator()`

```
GarbageCollected ComputedExpression::__getIterator (
    const GarbageCollected & collection ) const [virtual], [inherited]
```

Get an iterator for the expression.

Parameters

<i>collection</i>	The GarbageCollected value that will serve as the collection through which to iterate.
-------------------	--

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.37.3.9 `__index()`

```
GarbageCollected ComputedExpression::__index (
    const GarbageCollected & index ) const [virtual], [inherited]
```

Perform an index operation.

Parameters

<i>index</i>	The index expression provided by the script.
--------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.37.3.10 `__integer()`

```
GarbageCollected ComputedExpressionInteger::__integer ( ) const [override], [virtual]
```

Perform a type cast to integer.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.37.3.11 `__iteratorNext()`

```
GarbageCollected ComputedExpression::__iteratorNext (
    size_t index = 0 ) const [virtual], [inherited]
```

Get the next iterative value.

Parameters

<code>index</code>	The desired index value.
--------------------	--------------------------

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIterator](#), and [Tang::ComputedExpressionArray](#).

5.37.3.12 `__lessThan()`

```
GarbageCollected ComputedExpressionInteger::__lessThan (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the "less than" comparison.

Parameters

<code>rhs</code>	The GarbageCollected value to compare against.
------------------	--

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.37.3.13 `__modulo()`

```
GarbageCollected ComputedExpressionInteger::__modulo (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the result of moduloing this value and the supplied value.

Parameters

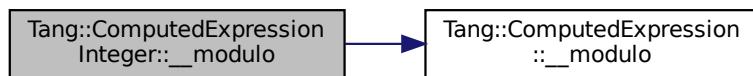
<i>rhs</i>	The GarbageCollected value to modulo this by.
------------	---

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.37.3.14 __multiply()

```
GarbageCollected ComputedExpressionInteger::__multiply (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the result of multiplying this value and the supplied value.

Parameters

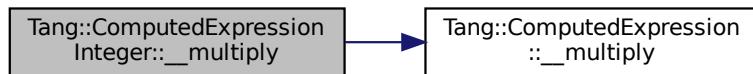
<i>rhs</i>	The GarbageCollected value to multiply to this.
------------	---

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.37.3.15 `__negative()`

```
GarbageCollected ComputedExpressionInteger::__negative ( ) const [override], [virtual]
```

Compute the result of negating this value.

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.37.3.16 `__not()`

```
GarbageCollected ComputedExpressionInteger::__not ( ) const [override], [virtual]
```

Compute the logical not of this value.

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.37.3.17 `__period()`

```
GarbageCollected ComputedExpression::__period (
    const GarbageCollected & member,
    std::shared_ptr< TangBase > & tang ) const [virtual], [inherited]
```

Perform a member access (period) operation.

Parameters

<code>member</code>	The member expression provided by the script.
---------------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionLibrary](#).

5.37.3.18 __slice()

```
GarbageCollected ComputedExpression::__slice (
    const GarbageCollected & begin,
    const GarbageCollected & end,
    const GarbageCollected & skip ) const [virtual], [inherited]
```

Perform a slice operation.

Convention will follow Python semantics, in which a slice will start at the provided index position, and go up to but not including the end index. The slice will default to an index increment of 1, but can be defined as another integer value.

Parameters

<i>begin</i>	The begin index expression provided by the script.
<i>end</i>	The end index expression provided by the script.
<i>skip</i>	The skip index expression provided by the script.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), and [Tang::ComputedExpressionArray](#).

5.37.3.19 __string()

```
GarbageCollected ComputedExpressionInteger::__string () const [override], [virtual]
```

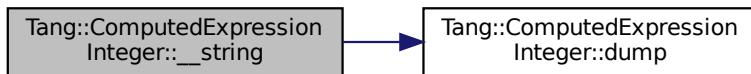
Perform a type cast to string.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.37.3.20 __subtract()

```
GarbageCollected ComputedExpressionInteger::__subtract (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the result of subtracting this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to subtract from this.
------------	---

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:

**5.37.3.21 dump()**

```
string ComputedExpressionInteger::dump ( ) const [override], [virtual]
```

Output the contents of the [ComputedExpression](#) as a string.

Returns

A string representation of the computed expression.

Reimplemented from [Tang::ComputedExpression](#).

5.37.3.22 getValue()

```
Tang::integer_t ComputedExpressionInteger::getValue ( ) const
```

Helper function to get the value associated with this expression.

Returns

The value associated with this expression.

5.37.3.23 is_equal() [1/6]

```
bool ComputedExpressionInteger::is_equal (
    const bool & val ) const [override], [virtual]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented from [Tang::ComputedExpression](#).

5.37.3.24 is_equal() [2/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Error & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionError](#).

5.37.3.25 is_equal() [3/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::nullptr_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

5.37.3.26 `is_equal()` [4/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::string & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#).

5.37.3.27 `is_equal()` [5/6]

```
bool ComputedExpressionInteger::is_equal (
    const Tang::float_t & val ) const [override], [virtual]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented from [Tang::ComputedExpression](#).

5.37.3.28 `is_equal()` [6/6]

```
bool ComputedExpressionInteger::is_equal (
    const Tang::integer_t & val ) const [override], [virtual]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented from [Tang::ComputedExpression](#).

5.37.3.29 isCopyNeeded()

```
bool ComputedExpression::isCopyNeeded ( ) const [virtual], [inherited]
```

Determine whether or not a copy is needed.

Copying is only required for ComputedExpressions which serve as containers, such as [ComputedExpressionArray](#) and [ComputedExpressionObject](#).

Returns

Whether or not a copy is needed.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.37.3.30 makeCopy()

```
GarbageCollected ComputedExpressionInteger::makeCopy ( ) const [override], [virtual]
```

Make a copy of the [ComputedExpression](#) (recursively, if appropriate).

Returns

A [Tang::GarbageCollected](#) value for the new [ComputedExpression](#).

Reimplemented from [Tang::ComputedExpression](#).

The documentation for this class was generated from the following files:

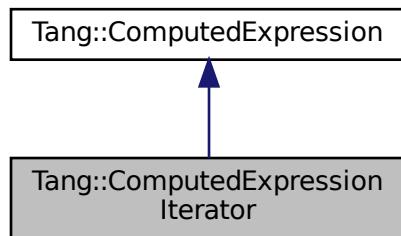
- include/computedExpressionInteger.hpp
- src/computedExpressionInteger.cpp

5.38 Tang::ComputedExpressionIterator Class Reference

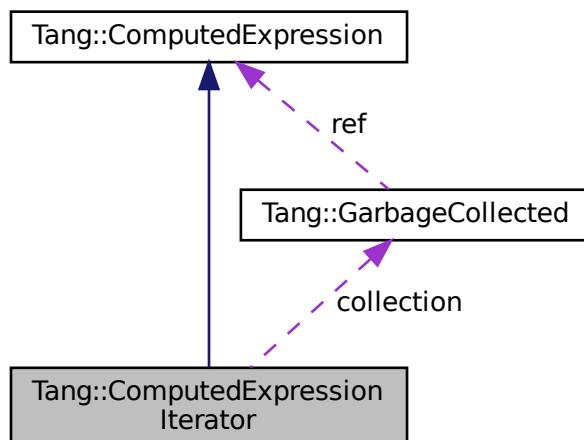
Represents an iterator that is the result of a computation.

```
#include <computedExpressionIterator.hpp>
```

Inheritance diagram for Tang::ComputedExpressionIterator:



Collaboration diagram for Tang::ComputedExpressionIterator:



Public Member Functions

- [ComputedExpressionIterator \(Tang::GarbageCollected collection\)](#)
Construct an Iterator result.
- virtual std::string [dump \(\) const override](#)
Output the contents of the [ComputedExpression](#) as a string.

- virtual `GarbageCollected __iteratorNext (size_t index) const override`
Get the next iterative value.
- virtual `std::string __asCode () const`
Output the contents of the `ComputedExpression` as a string similar to how it would be represented as code.
- virtual `bool isCopyNeeded () const`
Determine whether or not a copy is needed.
- virtual `GarbageCollected makeCopy () const`
Make a copy of the `ComputedExpression` (recursively, if appropriate).
- virtual `bool is_equal (const Tang::integer_t &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal (const Tang::float_t &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal (const bool &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal (const std::string &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal (const Error &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal (const std::nullptr_t &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `GarbageCollected __assign_index (const GarbageCollected &index, const GarbageCollected &value)`
Perform an index assignment to the supplied value.
- virtual `GarbageCollected __add (const GarbageCollected &rhs) const`
Compute the result of adding this value and the supplied value.
- virtual `GarbageCollected __subtract (const GarbageCollected &rhs) const`
Compute the result of subtracting this value and the supplied value.
- virtual `GarbageCollected __multiply (const GarbageCollected &rhs) const`
Compute the result of multiplying this value and the supplied value.
- virtual `GarbageCollected __divide (const GarbageCollected &rhs) const`
Compute the result of dividing this value and the supplied value.
- virtual `GarbageCollected __modulo (const GarbageCollected &rhs) const`
Compute the result of moduloing this value and the supplied value.
- virtual `GarbageCollected __negative () const`
Compute the result of negating this value.
- virtual `GarbageCollected __not () const`
Compute the logical not of this value.
- virtual `GarbageCollected __lessThan (const GarbageCollected &rhs) const`
Compute the "less than" comparison.
- virtual `GarbageCollected __equal (const GarbageCollected &rhs) const`
Perform an equality test.
- virtual `GarbageCollected __period (const GarbageCollected &member, std::shared_ptr<TangBase> &tang) const`
Perform a member access (period) operation.
- virtual `GarbageCollected __index (const GarbageCollected &index) const`
Perform an index operation.
- virtual `GarbageCollected __slice (const GarbageCollected &begin, const GarbageCollected &end, const GarbageCollected &skip) const`
Perform a slice operation.
- virtual `GarbageCollected __getIterator (const GarbageCollected &collection) const`
Get an iterator for the expression.
- virtual `GarbageCollected __integer () const`

- virtual `GarbageCollected __float () const`
Perform a type cast to float.
- virtual `GarbageCollected __boolean () const`
Perform a type cast to boolean.
- virtual `GarbageCollected __string () const`
Perform a type cast to string.

Private Attributes

- `Tang::GarbageCollected collection`
The target collection.
- `size_t index`
The next index.

5.38.1 Detailed Description

Represents an Iterator that is the result of a computation.

5.38.2 Constructor & Destructor Documentation

5.38.2.1 ComputedExpressionIterator()

```
ComputedExpressionIterator::ComputedExpressionIterator (
    Tang::GarbageCollected collection )
```

Construct an Iterator result.

Parameters

<code>collection</code>	The collection through which the iterator processes
-------------------------	---

5.38.3 Member Function Documentation

5.38.3.1 __add()

```
GarbageCollected ComputedExpression::__add (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of adding this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to add to this.
------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.38.3.2 [__asCode\(\)](#)

```
string ComputedExpression::__asCode ( ) const [virtual], [inherited]
```

Output the contents of the [ComputedExpression](#) as a string similar to how it would be represented as code.

Returns

A code-string representation of the computed expression.

Reimplemented in [Tang::ComputedExpressionString](#).

5.38.3.3 [__assign_index\(\)](#)

```
GarbageCollected ComputedExpression::__assign_index (
    const GarbageCollected & index,
    const GarbageCollected & value ) [virtual], [inherited]
```

Perform an index assignment to the supplied value.

Parameters

<i>index</i>	The index to which the value should be applied.
<i>value</i>	The value to store.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.38.3.4 __boolean()

```
GarbageCollected ComputedExpression::__boolean ( ) const [virtual], [inherited]
```

Perform a type cast to boolean.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.38.3.5 __divide()

```
GarbageCollected ComputedExpression::__divide (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of dividing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to divide this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.38.3.6 __equal()

```
GarbageCollected ComputedExpression::__equal (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Perform an equality test.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionNativeLibraryFunction](#), [Tang::ComputedExpressionNativeBoundFunction](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), [Tang::ComputedExpressionCompiledFunction](#), and [Tang::ComputedExpressionBoolean](#).

5.38.3.7 __float()

```
GarbageCollected ComputedExpression::__float () const [virtual], [inherited]
```

Perform a type cast to float.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.38.3.8 __getIterator()

```
GarbageCollected ComputedExpression::__getIterator (
    const GarbageCollected & collection ) const [virtual], [inherited]
```

Get an iterator for the expression.

Parameters

<i>collection</i>	The GarbageCollected value that will serve as the collection through which to iterate.
-------------------	--

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.38.3.9 __index()

```
GarbageCollected ComputedExpression::__index (
    const GarbageCollected & index ) const [virtual], [inherited]
```

Perform an index operation.

Parameters

<i>index</i>	The index expression provided by the script.
--------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.38.3.10 __integer()

GarbageCollected `ComputedExpression::__integer () const [virtual], [inherited]`

Perform a type cast to integer.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.38.3.11 __iteratorNext()

GarbageCollected `ComputedExpressionIterator::__iteratorNext (size_t index) const [override], [virtual]`

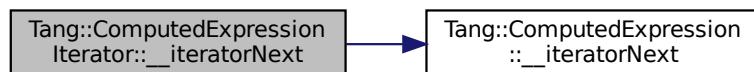
Get the next iterative value.

Parameters

<code>index</code>	The desired index value.
--------------------	--------------------------

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.38.3.12 __lessThan()

```
GarbageCollected ComputedExpression::__lessThan (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the "less than" comparison.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.38.3.13 __modulo()

```
GarbageCollected ComputedExpression::__modulo (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of moduloing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to modulo this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

5.38.3.14 __multiply()

```
GarbageCollected ComputedExpression::__multiply (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of multiplying this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to multiply to this.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.38.3.15 __negative()

```
GarbageCollected ComputedExpression::__negative ( ) const [virtual], [inherited]
```

Compute the result of negating this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.38.3.16 __not()

```
GarbageCollected ComputedExpression::__not ( ) const [virtual], [inherited]
```

Compute the logical not of this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.38.3.17 __period()

```
GarbageCollected ComputedExpression::__period (
    const GarbageCollected & member,
    std::shared_ptr< TangBase > & tang ) const [virtual], [inherited]
```

Perform a member access (period) operation.

Parameters

<i>member</i>	The member expression provided by the script.
---------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionLibrary](#).

5.38.3.18 __slice()

```
GarbageCollected ComputedExpression::__slice (
    const GarbageCollected & begin,
    const GarbageCollected & end,
    const GarbageCollected & skip ) const [virtual], [inherited]
```

Perform a slice operation.

Convention will follow Python semantics, in which a slice will start at the provided index position, and go up to but not including the end index. The slice will default to an index increment of 1, but can be defined as another integer value.

Parameters

<i>begin</i>	The begin index expression provided by the script.
<i>end</i>	The end index expression provided by the script.
<i>skip</i>	The skip index expression provided by the script.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), and [Tang::ComputedExpressionArray](#).

5.38.3.19 __string()

```
GarbageCollected ComputedExpression::__string () const [virtual], [inherited]
```

Perform a type cast to string.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIteratorEnd](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionArray](#).

5.38.3.20 __subtract()

```
GarbageCollected ComputedExpression::__subtract (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of subtracting this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to subtract from this.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.38.3.21 dump()

```
string ComputedExpressionIterator::dump ( ) const [override], [virtual]
```

Output the contents of the [ComputedExpression](#) as a string.

Returns

A string representation of the computed expression.

Reimplemented from [Tang::ComputedExpression](#).

5.38.3.22 is_equal() [1/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const bool & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionBoolean](#).

5.38.3.23 `is_equal()` [2/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Error & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionError](#).

5.38.3.24 is_equal() [3/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::nullptr_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

5.38.3.25 is_equal() [4/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::string & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#).

5.38.3.26 is_equal() [5/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::float_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

val	The value to compare against.
-----	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.38.3.27 is_equal() [6/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::integer_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

val	The value to compare against.
-----	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.38.3.28 isCopyNeeded()

```
bool ComputedExpression::isCopyNeeded ( ) const [virtual], [inherited]
```

Determine whether or not a copy is needed.

Copying is only required for ComputedExpressions which serve as containers, such as [ComputedExpressionArray](#) and [ComputedExpressionObject](#).

Returns

Whether or not a copy is needed.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.38.3.29 makeCopy()

```
GarbageCollected ComputedExpression::makeCopy () const [virtual], [inherited]
```

Make a copy of the [ComputedExpression](#) (recursively, if appropriate).

Returns

A [Tang::GarbageCollected](#) value for the new [ComputedExpression](#).

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionNativeLibraryFunction](#), [Tang::ComputedExpressionNativeBoundFunction](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionLibraryBase](#), [Tang::ComputedExpressionLibrary](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), [Tang::ComputedExpressionCompiledFunction](#), [Tang::ComputedExpressionBoolean](#), and [Tang::ComputedExpressionArray](#).

The documentation for this class was generated from the following files:

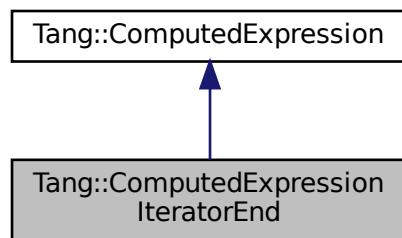
- [include/computedExpressionIterator.hpp](#)
- [src/computedExpressionIterator.cpp](#)

5.39 Tang::ComputedExpressionIteratorEnd Class Reference

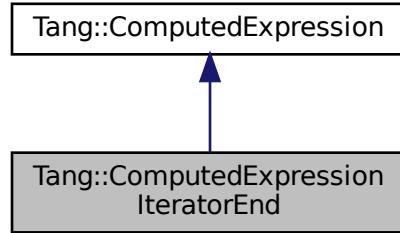
Represents that a collection has no more values through which to iterate.

```
#include <computedExpressionIteratorEnd.hpp>
```

Inheritance diagram for Tang::ComputedExpressionIteratorEnd:



Collaboration diagram for Tang::ComputedExpressionIteratorEnd:



Public Member Functions

- `ComputedExpressionIteratorEnd ()`
Construct an IteratorEnd result.
- virtual std::string `dump () const override`
Output the contents of the `ComputedExpression` as a string.
- virtual `GarbageCollected __string () const override`
Perform a type cast to string.
- virtual std::string `__asCode () const`
Output the contents of the `ComputedExpression` as a string similar to how it would be represented as code.
- virtual bool `isCopyNeeded () const`
Determine whether or not a copy is needed.
- virtual `GarbageCollected makeCopy () const`
Make a copy of the `ComputedExpression` (recursively, if appropriate).
- virtual bool `is_equal (const Tang::integer_t &val) const`
Check whether or not the computed expression is equal to another value.
- virtual bool `is_equal (const Tang::float_t &val) const`
Check whether or not the computed expression is equal to another value.
- virtual bool `is_equal (const bool &val) const`
Check whether or not the computed expression is equal to another value.
- virtual bool `is_equal (const std::string &val) const`
Check whether or not the computed expression is equal to another value.
- virtual bool `is_equal (const Error &val) const`
Check whether or not the computed expression is equal to another value.
- virtual bool `is_equal (const std::nullptr_t &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `GarbageCollected __assign_index (const GarbageCollected &index, const GarbageCollected &value)`
Perform an index assignment to the supplied value.
- virtual `GarbageCollected __add (const GarbageCollected &rhs) const`
Compute the result of adding this value and the supplied value.
- virtual `GarbageCollected __subtract (const GarbageCollected &rhs) const`
Compute the result of subtracting this value and the supplied value.
- virtual `GarbageCollected __multiply (const GarbageCollected &rhs) const`
Compute the result of multiplying this value and the supplied value.

- virtual `GarbageCollected __divide (const GarbageCollected &rhs) const`
Compute the result of dividing this value and the supplied value.
- virtual `GarbageCollected __modulo (const GarbageCollected &rhs) const`
Compute the result of moduloing this value and the supplied value.
- virtual `GarbageCollected __negative () const`
Compute the result of negating this value.
- virtual `GarbageCollected __not () const`
Compute the logical not of this value.
- virtual `GarbageCollected __lessThan (const GarbageCollected &rhs) const`
Compute the "less than" comparison.
- virtual `GarbageCollected __equal (const GarbageCollected &rhs) const`
Perform an equality test.
- virtual `GarbageCollected __period (const GarbageCollected &member, std::shared_ptr< TangBase > &tang) const`
Perform a member access (period) operation.
- virtual `GarbageCollected __index (const GarbageCollected &index) const`
Perform an index operation.
- virtual `GarbageCollected __slice (const GarbageCollected &begin, const GarbageCollected &end, const GarbageCollected &skip) const`
Perform a slice operation.
- virtual `GarbageCollected __getIterator (const GarbageCollected &collection) const`
Get an iterator for the expression.
- virtual `GarbageCollected __iteratorNext (size_t index=0) const`
Get the next iterative value.
- virtual `GarbageCollected __integer () const`
Perform a type cast to integer.
- virtual `GarbageCollected __float () const`
Perform a type cast to float.
- virtual `GarbageCollected __boolean () const`
Perform a type cast to boolean.

5.39.1 Detailed Description

Represents that a collection has no more values through which to iterate.

5.39.2 Member Function Documentation

5.39.2.1 `__add()`

```
GarbageCollected ComputedExpression::__add (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of adding this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to add to this.
------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.39.2.2 [__asCode\(\)](#)

```
string ComputedExpression::__asCode ( ) const [virtual], [inherited]
```

Output the contents of the [ComputedExpression](#) as a string similar to how it would be represented as code.

Returns

A code-string representation of the computed expression.

Reimplemented in [Tang::ComputedExpressionString](#).

5.39.2.3 [__assign_index\(\)](#)

```
GarbageCollected ComputedExpression::__assign_index (
    const GarbageCollected & index,
    const GarbageCollected & value ) [virtual], [inherited]
```

Perform an index assignment to the supplied value.

Parameters

<i>index</i>	The index to which the value should be applied.
<i>value</i>	The value to store.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.39.2.4 __boolean()

```
GarbageCollected ComputedExpression::__boolean ( ) const [virtual], [inherited]
```

Perform a type cast to boolean.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.39.2.5 __divide()

```
GarbageCollected ComputedExpression::__divide (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of dividing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to divide this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.39.2.6 __equal()

```
GarbageCollected ComputedExpression::__equal (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Perform an equality test.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionNativeLibraryFunction](#), [Tang::ComputedExpressionNativeBoundFunction](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), [Tang::ComputedExpressionCompiledFunction](#), and [Tang::ComputedExpressionBoolean](#).

5.39.2.7 __float()

```
GarbageCollected ComputedExpression::__float () const [virtual], [inherited]
```

Perform a type cast to float.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.39.2.8 __getIterator()

```
GarbageCollected ComputedExpression::__getIterator (
    const GarbageCollected & collection ) const [virtual], [inherited]
```

Get an iterator for the expression.

Parameters

<i>collection</i>	The GarbageCollected value that will serve as the collection through which to iterate.
-------------------	--

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.39.2.9 __index()

```
GarbageCollected ComputedExpression::__index (
    const GarbageCollected & index ) const [virtual], [inherited]
```

Perform an index operation.

Parameters

<i>index</i>	The index expression provided by the script.
--------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.39.2.10 `__integer()`

```
GarbageCollected ComputedExpression::__integer ( ) const [virtual], [inherited]
```

Perform a type cast to integer.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.39.2.11 `__iteratorNext()`

```
GarbageCollected ComputedExpression::__iteratorNext (
    size_t index = 0 ) const [virtual], [inherited]
```

Get the next iterative value.

Parameters

<i>index</i>	The desired index value.
--------------	--------------------------

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIterator](#), and [Tang::ComputedExpressionArray](#).

5.39.2.12 `__lessThan()`

```
GarbageCollected ComputedExpression::__lessThan (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the "less than" comparison.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.39.2.13 `__modulo()`

```
GarbageCollected ComputedExpression::__modulo (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of moduloing this value and the supplied value.

Parameters

<code>rhs</code>	The GarbageCollected value to modulo this by.
------------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

5.39.2.14 `__multiply()`

```
GarbageCollected ComputedExpression::__multiply (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of multiplying this value and the supplied value.

Parameters

<code>rhs</code>	The GarbageCollected value to multiply to this.
------------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.39.2.15 `__negative()`

```
GarbageCollected ComputedExpression::__negative ( ) const [virtual], [inherited]
```

Compute the result of negating this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.39.2.16 `__not()`

```
GarbageCollected ComputedExpression::__not ( ) const [virtual], [inherited]
```

Compute the logical not of this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.39.2.17 `__period()`

```
GarbageCollected ComputedExpression::__period (
    const GarbageCollected & member,
    std::shared_ptr< TangBase > & tang ) const [virtual], [inherited]
```

Perform a member access (period) operation.

Parameters

<code>member</code>	The member expression provided by the script.
---------------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionLibrary](#).

5.39.2.18 __slice()

```
GarbageCollected ComputedExpression::__slice (
    const GarbageCollected & begin,
    const GarbageCollected & end,
    const GarbageCollected & skip ) const [virtual], [inherited]
```

Perform a slice operation.

Convention will follow Python semantics, in which a slice will start at the provided index position, and go up to but not including the end index. The slice will default to an index increment of 1, but can be defined as another integer value.

Parameters

<i>begin</i>	The begin index expression provided by the script.
<i>end</i>	The end index expression provided by the script.
<i>skip</i>	The skip index expression provided by the script.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), and [Tang::ComputedExpressionArray](#).

5.39.2.19 __string()

```
GarbageCollected ComputedExpressionIteratorEnd::__string () const [override], [virtual]
```

Perform a type cast to string.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.39.2.20 __subtract()

```
GarbageCollected ComputedExpression::__subtract (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of subtracting this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to subtract from this.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.39.2.21 dump()

```
string ComputedExpressionIteratorEnd::dump ( ) const [override], [virtual]
```

Output the contents of the [ComputedExpression](#) as a string.

Returns

A string representation of the computed expression.

Reimplemented from [Tang::ComputedExpression](#).

5.39.2.22 is_equal() [1/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const bool & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionBoolean](#).

5.39.2.23 `is_equal()` [2/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Error & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionError](#).

5.39.2.24 is_equal() [3/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::nullptr_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

5.39.2.25 is_equal() [4/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::string & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#).

5.39.2.26 is_equal() [5/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::float_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

val	The value to compare against.
-----	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.39.2.27 is_equal() [6/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::integer_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

val	The value to compare against.
-----	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.39.2.28 isCopyNeeded()

```
bool ComputedExpression::isCopyNeeded ( ) const [virtual], [inherited]
```

Determine whether or not a copy is needed.

Copying is only required for ComputedExpressions which serve as containers, such as [ComputedExpressionArray](#) and [ComputedExpressionObject](#).

Returns

Whether or not a copy is needed.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.39.2.29 makeCopy()

```
GarbageCollected ComputedExpression::makeCopy () const [virtual], [inherited]
```

Make a copy of the [ComputedExpression](#) (recursively, if appropriate).

Returns

A [Tang::GarbageCollected](#) value for the new [ComputedExpression](#).

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionNativeLibraryFunction](#), [Tang::ComputedExpressionNativeBoundFunction](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionLibraryBase](#), [Tang::ComputedExpressionLibrary](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), [Tang::ComputedExpressionCompiledFunction](#), [Tang::ComputedExpressionBoolean](#), and [Tang::ComputedExpressionArray](#).

The documentation for this class was generated from the following files:

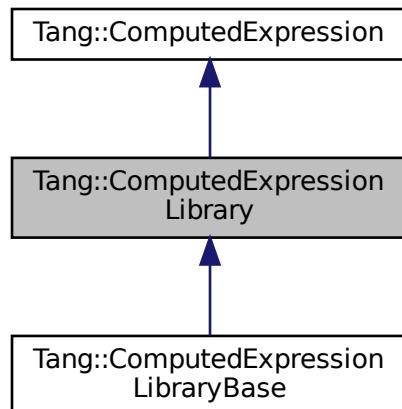
- [include/computedExpressionIteratorEnd.hpp](#)
- [src/computedExpressionIteratorEnd.cpp](#)

5.40 Tang::ComputedExpressionLibrary Class Reference

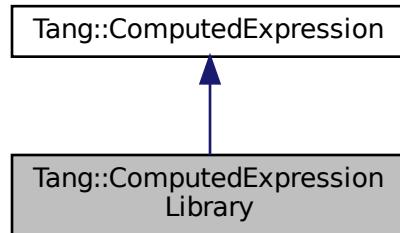
Represents a Runtime Library.

```
#include <computedExpressionLibrary.hpp>
```

Inheritance diagram for Tang::ComputedExpressionLibrary:



Collaboration diagram for Tang::ComputedExpressionLibrary:



Public Member Functions

- [`ComputedExpressionLibrary \(\)`](#)
Construct a Runtime Library.
- [`virtual std::string dump \(\) const override`](#)
Output the contents of the `ComputedExpression` as a string.
- [`GarbageCollected makeCopy \(\) const override`](#)
Make a copy of the `ComputedExpression` (recursively, if appropriate).
- [`GarbageCollected __period \(const GarbageCollected &member, std::shared_ptr< TangBase > &tang\) const override`](#)
Perform a member access (period) operation.
- [`virtual std::string __asCode \(\) const`](#)
Output the contents of the `ComputedExpression` as a string similar to how it would be represented as code.
- [`virtual bool isCopyNeeded \(\) const`](#)
Determine whether or not a copy is needed.
- [`virtual bool is_equal \(const Tang::integer_t &val\) const`](#)
Check whether or not the computed expression is equal to another value.
- [`virtual bool is_equal \(const Tang::float_t &val\) const`](#)
Check whether or not the computed expression is equal to another value.
- [`virtual bool is_equal \(const bool &val\) const`](#)
Check whether or not the computed expression is equal to another value.
- [`virtual bool is_equal \(const std::string &val\) const`](#)
Check whether or not the computed expression is equal to another value.
- [`virtual bool is_equal \(const Error &val\) const`](#)
Check whether or not the computed expression is equal to another value.
- [`virtual bool is_equal \(const std::nullptr_t &val\) const`](#)
Check whether or not the computed expression is equal to another value.
- [`virtual GarbageCollected __assign_index \(const GarbageCollected &index, const GarbageCollected &value\)`](#)
Perform an index assignment to the supplied value.
- [`virtual GarbageCollected __add \(const GarbageCollected &rhs\) const`](#)
Compute the result of adding this value and the supplied value.
- [`virtual GarbageCollected __subtract \(const GarbageCollected &rhs\) const`](#)
Compute the result of subtracting this value and the supplied value.
- [`virtual GarbageCollected __multiply \(const GarbageCollected &rhs\) const`](#)

- virtual `GarbageCollected __divide` (const `GarbageCollected &rhs`) const

Compute the result of dividing this value and the supplied value.
- virtual `GarbageCollected __modulo` (const `GarbageCollected &rhs`) const

Compute the result of moduloing this value and the supplied value.
- virtual `GarbageCollected __negative` () const

Compute the result of negating this value.
- virtual `GarbageCollected __not` () const

Compute the logical not of this value.
- virtual `GarbageCollected __lessThan` (const `GarbageCollected &rhs`) const

Compute the "less than" comparison.
- virtual `GarbageCollected __equal` (const `GarbageCollected &rhs`) const

Perform an equality test.
- virtual `GarbageCollected __index` (const `GarbageCollected &index`) const

Perform an index operation.
- virtual `GarbageCollected __slice` (const `GarbageCollected &begin`, const `GarbageCollected &end`, const `GarbageCollected &skip`) const

Perform a slice operation.
- virtual `GarbageCollected __getIterator` (const `GarbageCollected &collection`) const

Get an iterator for the expression.
- virtual `GarbageCollected __iteratorNext` (size_t index=0) const

Get the next iterative value.
- virtual `GarbageCollected __integer` () const

Perform a type cast to integer.
- virtual `GarbageCollected __float` () const

Perform a type cast to float.
- virtual `GarbageCollected __boolean` () const

Perform a type cast to boolean.
- virtual `GarbageCollected __string` () const

Perform a type cast to string.

5.40.1 Detailed Description

Represents a Runtime Library.

5.40.2 Member Function Documentation

5.40.2.1 `__add()`

```
GarbageCollected ComputedExpression::__add (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of adding this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to add to this.
------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.40.2.2 [__asCode\(\)](#)

```
string ComputedExpression::__asCode ( ) const [virtual], [inherited]
```

Output the contents of the [ComputedExpression](#) as a string similar to how it would be represented as code.

Returns

A code-string representation of the computed expression.

Reimplemented in [Tang::ComputedExpressionString](#).

5.40.2.3 [__assign_index\(\)](#)

```
GarbageCollected ComputedExpression::__assign_index (
    const GarbageCollected & index,
    const GarbageCollected & value ) [virtual], [inherited]
```

Perform an index assignment to the supplied value.

Parameters

<i>index</i>	The index to which the value should be applied.
<i>value</i>	The value to store.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.40.2.4 __boolean()

```
GarbageCollected ComputedExpression::__boolean ( ) const [virtual], [inherited]
```

Perform a type cast to boolean.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.40.2.5 __divide()

```
GarbageCollected ComputedExpression::__divide (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of dividing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to divide this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.40.2.6 __equal()

```
GarbageCollected ComputedExpression::__equal (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Perform an equality test.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionNativeLibraryFunction](#), [Tang::ComputedExpressionNativeBoundFunction](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), [Tang::ComputedExpressionCompiledFunction](#), and [Tang::ComputedExpressionBoolean](#).

5.40.2.7 __float()

```
GarbageCollected ComputedExpression::__float () const [virtual], [inherited]
```

Perform a type cast to float.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.40.2.8 __getIterator()

```
GarbageCollected ComputedExpression::__getIterator (
    const GarbageCollected & collection ) const [virtual], [inherited]
```

Get an iterator for the expression.

Parameters

<i>collection</i>	The GarbageCollected value that will serve as the collection through which to iterate.
-------------------	--

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.40.2.9 __index()

```
GarbageCollected ComputedExpression::__index (
    const GarbageCollected & index ) const [virtual], [inherited]
```

Perform an index operation.

Parameters

<i>index</i>	The index expression provided by the script.
--------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.40.2.10 __integer()

```
GarbageCollected ComputedExpression::__integer ( ) const [virtual], [inherited]
```

Perform a type cast to integer.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.40.2.11 __iteratorNext()

```
GarbageCollected ComputedExpression::__iteratorNext (
    size_t index = 0 ) const [virtual], [inherited]
```

Get the next iterative value.

Parameters

<i>index</i>	The desired index value.
--------------	--------------------------

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIterator](#), and [Tang::ComputedExpressionArray](#).

5.40.2.12 __lessThan()

```
GarbageCollected ComputedExpression::__lessThan (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the "less than" comparison.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.40.2.13 `__modulo()`

```
GarbageCollected ComputedExpression::__modulo (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of moduloing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to modulo this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

5.40.2.14 `__multiply()`

```
GarbageCollected ComputedExpression::__multiply (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of multiplying this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to multiply to this.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.40.2.15 `__negative()`

```
GarbageCollected ComputedExpression::__negative ( ) const [virtual], [inherited]
```

Compute the result of negating this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.40.2.16 `__not()`

```
GarbageCollected ComputedExpression::__not ( ) const [virtual], [inherited]
```

Compute the logical not of this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.40.2.17 `__period()`

```
GarbageCollected ComputedExpressionLibrary::__period (
    const GarbageCollected & member,
    std::shared_ptr< TangBase > & tang ) const [override], [virtual]
```

Perform a member access (period) operation.

Parameters

<code>member</code>	The member expression provided by the script.
---------------------	---

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.40.2.18 __slice()

```
GarbageCollected ComputedExpression::__slice (
    const GarbageCollected & begin,
    const GarbageCollected & end,
    const GarbageCollected & skip ) const [virtual], [inherited]
```

Perform a slice operation.

Convention will follow Python semantics, in which a slice will start at the provided index position, and go up to but not including the end index. The slice will default to an index increment of 1, but can be defined as another integer value.

Parameters

<i>begin</i>	The begin index expression provided by the script.
<i>end</i>	The end index expression provided by the script.
<i>skip</i>	The skip index expression provided by the script.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), and [Tang::ComputedExpressionArray](#).

5.40.2.19 __string()

```
GarbageCollected ComputedExpression::__string () const [virtual], [inherited]
```

Perform a type cast to string.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIteratorEnd](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionArray](#).

5.40.2.20 __subtract()

```
GarbageCollected ComputedExpression::__subtract (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of subtracting this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to subtract from this.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.40.2.21 dump()

```
std::string ComputedExpressionLibrary::dump ( ) const [override], [virtual]
```

Output the contents of the [ComputedExpression](#) as a string.

Returns

A string representation of the computed expression.

Reimplemented from [Tang::ComputedExpression](#).

5.40.2.22 is_equal() [1/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const bool & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionBoolean](#).

5.40.2.23 `is_equal()` [2/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Error & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionError](#).

5.40.2.24 is_equal() [3/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::nullptr_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

5.40.2.25 is_equal() [4/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::string & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#).

5.40.2.26 is_equal() [5/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::float_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

val	The value to compare against.
-----	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.40.2.27 is_equal() [6/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::integer_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

val	The value to compare against.
-----	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.40.2.28 isCopyNeeded()

```
bool ComputedExpression::isCopyNeeded ( ) const [virtual], [inherited]
```

Determine whether or not a copy is needed.

Copying is only required for ComputedExpressions which serve as containers, such as [ComputedExpressionArray](#) and [ComputedExpressionObject](#).

Returns

Whether or not a copy is needed.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.40.2.29 makeCopy()

`GarbageCollected` `ComputedExpressionLibrary::makeCopy () const [override], [virtual]`

Make a copy of the `ComputedExpression` (recursively, if appropriate).

Returns

A `Tang::GarbageCollected` value for the new `ComputedExpression`.

Reimplemented from `Tang::ComputedExpression`.

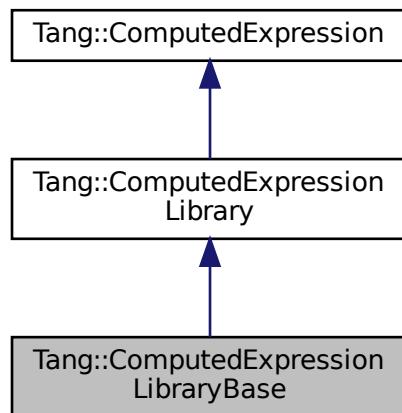
Reimplemented in `Tang::ComputedExpressionLibraryBase`.

The documentation for this class was generated from the following files:

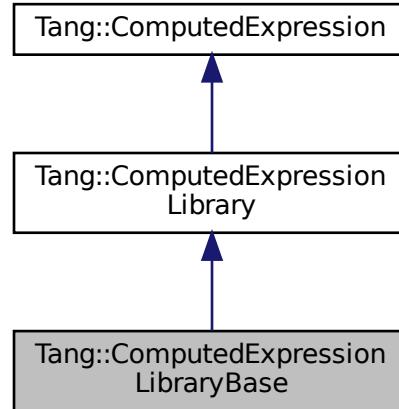
- `include/computedExpressionLibrary.hpp`
- `src/computedExpressionLibrary.cpp`

5.41 Tang::ComputedExpressionLibraryBase Class Reference

Inheritance diagram for `Tang::ComputedExpressionLibraryBase`:



Collaboration diagram for Tang::ComputedExpressionLibraryBase:



Public Member Functions

- `GarbageCollected makeCopy () const override`
Make a copy of the [ComputedExpression](#) (recursively, if appropriate).
- `virtual std::string dump () const override`
Output the contents of the [ComputedExpression](#) as a string.
- `GarbageCollected __period (const GarbageCollected &member, std::shared_ptr< TangBase > &tang) const override`
Perform a member access (period) operation.
- `virtual std::string __asCode () const`
Output the contents of the [ComputedExpression](#) as a string similar to how it would be represented as code.
- `virtual bool isCopyNeeded () const`
Determine whether or not a copy is needed.
- `virtual bool is_equal (const Tang::integer_t &val) const`
Check whether or not the computed expression is equal to another value.
- `virtual bool is_equal (const Tang::float_t &val) const`
Check whether or not the computed expression is equal to another value.
- `virtual bool is_equal (const bool &val) const`
Check whether or not the computed expression is equal to another value.
- `virtual bool is_equal (const std::string &val) const`
Check whether or not the computed expression is equal to another value.
- `virtual bool is_equal (const Error &val) const`
Check whether or not the computed expression is equal to another value.
- `virtual bool is_equal (const std::nullptr_t &val) const`
Check whether or not the computed expression is equal to another value.
- `virtual GarbageCollected __assign_index (const GarbageCollected &index, const GarbageCollected &value)`
Perform an index assignment to the supplied value.
- `virtual GarbageCollected __add (const GarbageCollected &rhs) const`
Compute the result of adding this value and the supplied value.

- virtual `GarbageCollected __subtract` (const `GarbageCollected &rhs`) const
Compute the result of subtracting this value and the supplied value.
- virtual `GarbageCollected __multiply` (const `GarbageCollected &rhs`) const
Compute the result of multiplying this value and the supplied value.
- virtual `GarbageCollected __divide` (const `GarbageCollected &rhs`) const
Compute the result of dividing this value and the supplied value.
- virtual `GarbageCollected __modulo` (const `GarbageCollected &rhs`) const
Compute the result of moduloing this value and the supplied value.
- virtual `GarbageCollected __negative` () const
Compute the result of negating this value.
- virtual `GarbageCollected __not` () const
Compute the logical not of this value.
- virtual `GarbageCollected __lessThan` (const `GarbageCollected &rhs`) const
Compute the "less than" comparison.
- virtual `GarbageCollected __equal` (const `GarbageCollected &rhs`) const
Perform an equality test.
- virtual `GarbageCollected __index` (const `GarbageCollected &index`) const
Perform an index operation.
- virtual `GarbageCollected __slice` (const `GarbageCollected &begin`, const `GarbageCollected &end`, const `GarbageCollected &skip`) const
Perform a slice operation.
- virtual `GarbageCollected __getIterator` (const `GarbageCollected &collection`) const
Get an iterator for the expression.
- virtual `GarbageCollected __iteratorNext` (size_t index=0) const
Get the next iterative value.
- virtual `GarbageCollected __integer` () const
Perform a type cast to integer.
- virtual `GarbageCollected __float` () const
Perform a type cast to float.
- virtual `GarbageCollected __boolean` () const
Perform a type cast to boolean.
- virtual `GarbageCollected __string` () const
Perform a type cast to string.

Static Public Member Functions

- static `LibraryFunctionMap getLibraryAttributes` ()

5.41.1 Member Function Documentation

5.41.1.1 __add()

```
GarbageCollected ComputedExpression::__add (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of adding this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to add to this.
------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.41.1.2 [__asCode\(\)](#)

```
string ComputedExpression::__asCode ( ) const [virtual], [inherited]
```

Output the contents of the [ComputedExpression](#) as a string similar to how it would be represented as code.

Returns

A code-string representation of the computed expression.

Reimplemented in [Tang::ComputedExpressionString](#).

5.41.1.3 [__assign_index\(\)](#)

```
GarbageCollected ComputedExpression::__assign_index (
    const GarbageCollected & index,
    const GarbageCollected & value ) [virtual], [inherited]
```

Perform an index assignment to the supplied value.

Parameters

<i>index</i>	The index to which the value should be applied.
<i>value</i>	The value to store.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.41.1.4 __boolean()

```
GarbageCollected ComputedExpression::__boolean ( ) const [virtual], [inherited]
```

Perform a type cast to boolean.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.41.1.5 __divide()

```
GarbageCollected ComputedExpression::__divide (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of dividing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to divide this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.41.1.6 __equal()

```
GarbageCollected ComputedExpression::__equal (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Perform an equality test.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionNativeLibraryFunction](#), [Tang::ComputedExpressionNativeBoundFunction](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), [Tang::ComputedExpressionCompiledFunction](#), and [Tang::ComputedExpressionBoolean](#).

5.41.1.7 `__float()`

`GarbageCollected ComputedExpression::__float () const [virtual], [inherited]`

Perform a type cast to float.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.41.1.8 `__getIterator()`

`GarbageCollected ComputedExpression::__getIterator (const GarbageCollected & collection) const [virtual], [inherited]`

Get an iterator for the expression.

Parameters

<code>collection</code>	The GarbageCollected value that will serve as the collection through which to iterate.
-------------------------	--

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.41.1.9 `__index()`

`GarbageCollected ComputedExpression::__index (const GarbageCollected & index) const [virtual], [inherited]`

Perform an index operation.

Parameters

<code>index</code>	The index expression provided by the script.
--------------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.41.1.10 `__integer()`

```
GarbageCollected ComputedExpression::__integer ( ) const [virtual], [inherited]
```

Perform a type cast to integer.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.41.1.11 `__iteratorNext()`

```
GarbageCollected ComputedExpression::__iteratorNext (
    size_t index = 0 ) const [virtual], [inherited]
```

Get the next iterative value.

Parameters

<code>index</code>	The desired index value.
--------------------	--------------------------

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIterator](#), and [Tang::ComputedExpressionArray](#).

5.41.1.12 `__lessThan()`

```
GarbageCollected ComputedExpression::__lessThan (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the "less than" comparison.

Parameters

<code>rhs</code>	The <code>GarbageCollected</code> value to compare against.
------------------	---

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.41.1.13 `__modulo()`

```
GarbageCollected ComputedExpression::__modulo (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of moduloing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to modulo this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

5.41.1.14 `__multiply()`

```
GarbageCollected ComputedExpression::__multiply (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of multiplying this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to multiply to this.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.41.1.15 `__negative()`

```
GarbageCollected ComputedExpression::__negative ( ) const [virtual], [inherited]
```

Compute the result of negating this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.41.1.16 `__not()`

```
GarbageCollected ComputedExpression::__not ( ) const [virtual], [inherited]
```

Compute the logical not of this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.41.1.17 `__period()`

```
GarbageCollected ComputedExpressionLibrary::__period (
    const GarbageCollected & member,
    std::shared_ptr< TangBase > & tang ) const [override], [virtual], [inherited]
```

Perform a member access (period) operation.

Parameters

<code>member</code>	The member expression provided by the script.
---------------------	---

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.41.1.18 __slice()

```
GarbageCollected ComputedExpression::__slice (
    const GarbageCollected & begin,
    const GarbageCollected & end,
    const GarbageCollected & skip ) const [virtual], [inherited]
```

Perform a slice operation.

Convention will follow Python semantics, in which a slice will start at the provided index position, and go up to but not including the end index. The slice will default to an index increment of 1, but can be defined as another integer value.

Parameters

<i>begin</i>	The begin index expression provided by the script.
<i>end</i>	The end index expression provided by the script.
<i>skip</i>	The skip index expression provided by the script.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), and [Tang::ComputedExpressionArray](#).

5.41.1.19 __string()

```
GarbageCollected ComputedExpression::__string () const [virtual], [inherited]
```

Perform a type cast to string.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIteratorEnd](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionArray](#).

5.41.1.20 __subtract()

```
GarbageCollected ComputedExpression::__subtract (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of subtracting this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to subtract from this.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.41.1.21 dump()

```
std::string ComputedExpressionLibrary::dump () const [override], [virtual], [inherited]
```

Output the contents of the [ComputedExpression](#) as a string.

Returns

A string representation of the computed expression.

Reimplemented from [Tang::ComputedExpression](#).

5.41.1.22 is_equal() [1/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const bool & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionBoolean](#).

5.41.1.23 `is_equal()` [2/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Error & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionError](#).

5.41.1.24 is_equal() [3/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::nullptr_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

5.41.1.25 is_equal() [4/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::string & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#).

5.41.1.26 is_equal() [5/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::float_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

val	The value to compare against.
-----	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.41.1.27 is_equal() [6/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::integer_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

val	The value to compare against.
-----	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.41.1.28 isCopyNeeded()

```
bool ComputedExpression::isCopyNeeded ( ) const [virtual], [inherited]
```

Determine whether or not a copy is needed.

Copying is only required for ComputedExpressions which serve as containers, such as [ComputedExpressionArray](#) and [ComputedExpressionObject](#).

Returns

Whether or not a copy is needed.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.41.1.29 makeCopy()

```
GarbageCollected Tang::ComputedExpressionLibraryBase::makeCopy () const [inline], [override], [virtual]
```

Make a copy of the [ComputedExpression](#) (recursively, if appropriate).

Returns

A [Tang::GarbageCollected](#) value for the new [ComputedExpression](#).

Reimplemented from [Tang::ComputedExpressionLibrary](#).

The documentation for this class was generated from the following file:

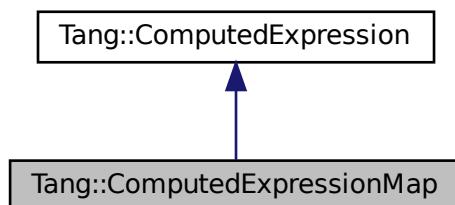
- include/computedExpressionLibraryBase.hpp

5.42 Tang::ComputedExpressionMap Class Reference

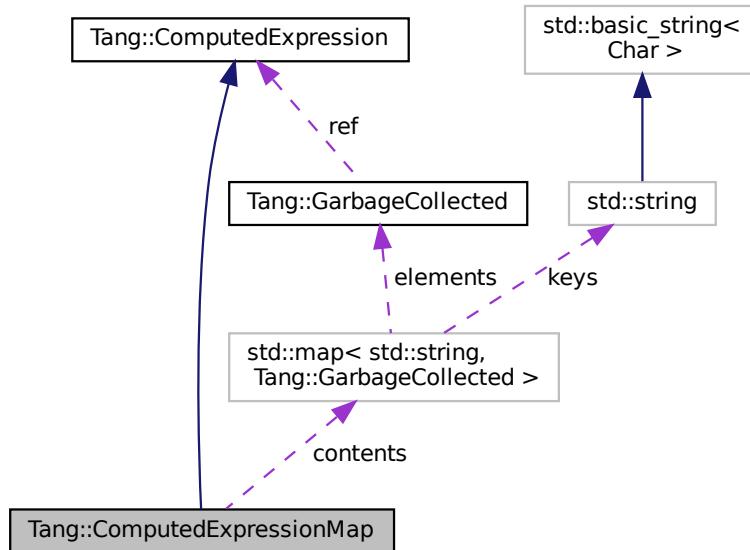
Represents an Map that is the result of a computation.

```
#include <computedExpressionMap.hpp>
```

Inheritance diagram for Tang::ComputedExpressionMap:



Collaboration diagram for Tang::ComputedExpressionMap:



Public Member Functions

- `ComputedExpressionMap (std::map< std::string, Tang::GarbageCollected > contents)`
Construct an Map result.
- `virtual std::string dump () const override`
Output the contents of the `ComputedExpression` as a string.
- `virtual bool isCopyNeeded () const override`
Determine whether or not a copy is needed.
- `GarbageCollected makeCopy () const override`
Make a copy of the `ComputedExpression` (recursively, if appropriate).
- `virtual GarbageCollected __index (const GarbageCollected &index) const override`
Perform an index operation.
- `virtual GarbageCollected __getIterator (const GarbageCollected &collection) const override`
Get an iterator for the expression.
- `virtual GarbageCollected __iteratorNext (size_t index) const override`
Get the next iterative value.
- `virtual GarbageCollected __assign_index (const GarbageCollected &index, const GarbageCollected &value) const override`
Perform an index assignment to the supplied value.
- `virtual GarbageCollected __string () const override`
Perform a type cast to string.
- `virtual GarbageCollected __boolean () const override`
Perform a type cast to boolean.
- `virtual std::string __asCode () const`
Output the contents of the `ComputedExpression` as a string similar to how it would be represented as code.
- `virtual bool is_equal (const Tang::integer_t &val) const`

- `virtual bool is_equal (const Tang::float_t &val) const`

Check whether or not the computed expression is equal to another value.
- `virtual bool is_equal (const bool &val) const`

Check whether or not the computed expression is equal to another value.
- `virtual bool is_equal (const std::string &val) const`

Check whether or not the computed expression is equal to another value.
- `virtual bool is_equal (const Error &val) const`

Check whether or not the computed expression is equal to another value.
- `virtual bool is_equal (const std::nullptr_t &val) const`

Check whether or not the computed expression is equal to another value.
- `virtual GarbageCollected __add (const GarbageCollected &rhs) const`

Compute the result of adding this value and the supplied value.
- `virtual GarbageCollected __subtract (const GarbageCollected &rhs) const`

Compute the result of subtracting this value and the supplied value.
- `virtual GarbageCollected __multiply (const GarbageCollected &rhs) const`

Compute the result of multiplying this value and the supplied value.
- `virtual GarbageCollected __divide (const GarbageCollected &rhs) const`

Compute the result of dividing this value and the supplied value.
- `virtual GarbageCollected __modulo (const GarbageCollected &rhs) const`

Compute the result of moduloing this value and the supplied value.
- `virtual GarbageCollected __negative () const`

Compute the result of negating this value.
- `virtual GarbageCollected __not () const`

Compute the logical not of this value.
- `virtual GarbageCollected __lessThan (const GarbageCollected &rhs) const`

Compute the "less than" comparison.
- `virtual GarbageCollected __equal (const GarbageCollected &rhs) const`

Perform an equality test.
- `virtual GarbageCollected __period (const GarbageCollected &member, std::shared_ptr< TangBase > &tang) const`

Perform a member access (period) operation.
- `virtual GarbageCollected __slice (const GarbageCollected &begin, const GarbageCollected &end, const GarbageCollected &skip) const`

Perform a slice operation.
- `virtual GarbageCollected __integer () const`

Perform a type cast to integer.
- `virtual GarbageCollected __float () const`

Perform a type cast to float.

Private Attributes

- `std::map< std::string, Tang::GarbageCollected > contents`

The map contents.

5.42.1 Detailed Description

Represents an Map that is the result of a computation.

5.42.2 Constructor & Destructor Documentation

5.42.2.1 ComputedExpressionMap()

```
ComputedExpressionMap::ComputedExpressionMap (
    std::map< std::string, Tang::GarbageCollected > contents )
```

Construct an Map result.

Parameters

<i>contents</i>	The map of key value pairs.
-----------------	-----------------------------

5.42.3 Member Function Documentation

5.42.3.1 __add()

```
GarbageCollected ComputedExpression::__add (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of adding this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to add to this.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.42.3.2 __asCode()

```
string ComputedExpression::__asCode ( ) const [virtual], [inherited]
```

Output the contents of the **ComputedExpression** as a string similar to how it would be represented as code.

Returns

A code-string representation of the computed expression.

Reimplemented in [Tang::ComputedExpressionString](#).

5.42.3.3 __assign_index()

```
GarbageCollected ComputedExpressionMap::__assign_index (
    const GarbageCollected & index,
    const GarbageCollected & value ) [override], [virtual]
```

Perform an index assignment to the supplied value.

Parameters

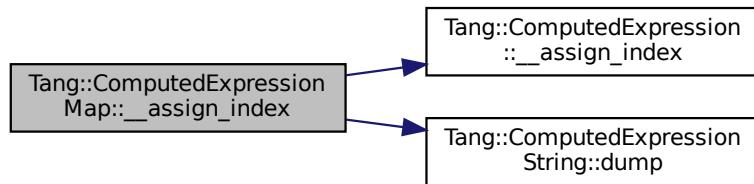
<i>index</i>	The index to which the value should be applied.
<i>value</i>	The value to store.

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.42.3.4 __boolean()

```
GarbageCollected ComputedExpressionMap::__boolean ( ) const [override], [virtual]
```

Perform a type cast to boolean.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.42.3.5 __divide()

```
GarbageCollected ComputedExpression::__divide (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of dividing this value and the supplied value.

Parameters

<code>rhs</code>	The GarbageCollected value to divide this by.
------------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.42.3.6 `__equal()`

```
GarbageCollected ComputedExpression::__equal (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Perform an equality test.

Parameters

<code>rhs</code>	The GarbageCollected value to compare against.
------------------	--

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionNativeLibraryFunction](#), [Tang::ComputedExpressionNativeBoundFunction](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), [Tang::ComputedExpressionCompiledFunction](#), and [Tang::ComputedExpressionBoolean](#).

5.42.3.7 `__float()`

```
GarbageCollected ComputedExpression::__float () const [virtual], [inherited]
```

Perform a type cast to float.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.42.3.8 `__getIterator()`

```
GarbageCollected ComputedExpressionMap::__getIterator (
    const GarbageCollected & collection ) const [override], [virtual]
```

Get an iterator for the expression.

Parameters

<i>collection</i>	The GarbageCollected value that will serve as the collection through which to iterate.
-------------------	--

Reimplemented from [Tang::ComputedExpression](#).

5.42.3.9 __index()

```
GarbageCollected ComputedExpressionMap::__index (
    const GarbageCollected & index ) const [override], [virtual]
```

Perform an index operation.

Parameters

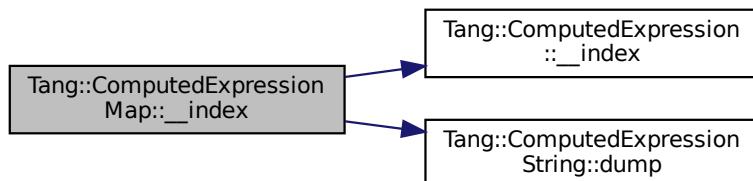
<i>index</i>	The index expression provided by the script.
--------------	--

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:

**5.42.3.10 __integer()**

```
GarbageCollected ComputedExpression::__integer () const [virtual], [inherited]
```

Perform a type cast to integer.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.42.3.11 __iteratorNext()

```
GarbageCollected ComputedExpressionMap::__iteratorNext (
    size_t index ) const [override], [virtual]
```

Get the next iterative value.

Parameters

<i>index</i>	The desired index value.
--------------	--------------------------

Reimplemented from [Tang::ComputedExpression](#).

5.42.3.12 __lessThan()

```
GarbageCollected ComputedExpression::__lessThan (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the "less than" comparison.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.42.3.13 __modulo()

```
GarbageCollected ComputedExpression::__modulo (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of moduloing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to modulo this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

5.42.3.14 `__multiply()`

```
GarbageCollected ComputedExpression::__multiply (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of multiplying this value and the supplied value.

Parameters

<code>rhs</code>	The GarbageCollected value to multiply to this.
------------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.42.3.15 `__negative()`

```
GarbageCollected ComputedExpression::__negative () const [virtual], [inherited]
```

Compute the result of negating this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.42.3.16 `__not()`

```
GarbageCollected ComputedExpression::__not () const [virtual], [inherited]
```

Compute the logical not of this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.42.3.17 `__period()`

```
GarbageCollected ComputedExpression::__period (
    const GarbageCollected & member,
    std::shared_ptr< TangBase > & tang ) const [virtual], [inherited]
```

Perform a member access (period) operation.

Parameters

<i>member</i>	The member expression provided by the script.
---------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionLibrary](#).

5.42.3.18 __slice()

```
GarbageCollected ComputedExpression::__slice (
    const GarbageCollected & begin,
    const GarbageCollected & end,
    const GarbageCollected & skip ) const [virtual], [inherited]
```

Perform a slice operation.

Convention will follow Python semantics, in which a slice will start at the provided index position, and go up to but not including the end index. The slice will default to an index increment of 1, but can be defined as another integer value.

Parameters

<i>begin</i>	The begin index expression provided by the script.
<i>end</i>	The end index expression provided by the script.
<i>skip</i>	The skip index expression provided by the script.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), and [Tang::ComputedExpressionArray](#).

5.42.3.19 __string()

```
GarbageCollected ComputedExpressionMap::__string ( ) const [override], [virtual]
```

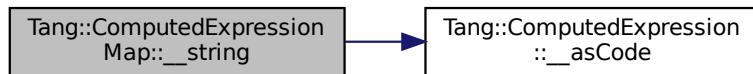
Perform a type cast to string.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:

**5.42.3.20 __subtract()**

```
GarbageCollected ComputedExpression::__subtract (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of subtracting this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to subtract from this.
------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.42.3.21 dump()

```
string ComputedExpressionMap::dump ( ) const [override], [virtual]
```

Output the contents of the [ComputedExpression](#) as a string.

Returns

A string representation of the computed expression.

Reimplemented from [Tang::ComputedExpression](#).

5.42.3.22 is_equal() [1/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const bool & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionBoolean](#).

5.42.3.23 is_equal() [2/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Error & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionError](#).

5.42.3.24 is_equal() [3/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::nullptr_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

5.42.3.25 is_equal() [4/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::string & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#).

5.42.3.26 is_equal() [5/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::float_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.42.3.27 is_equal() [6/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::integer_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.42.3.28 isCopyNeeded()

```
bool ComputedExpressionMap::isCopyNeeded ( ) const [override], [virtual]
```

Determine whether or not a copy is needed.

Copying is only required for ComputedExpressions which serve as containers, such as [ComputedExpressionArray](#) and [ComputedExpressionObject](#).

Returns

Whether or not a copy is needed.

Reimplemented from [Tang::ComputedExpression](#).

5.42.3.29 makeCopy()

```
GarbageCollected ComputedExpressionMap::makeCopy ( ) const [override], [virtual]
```

Make a copy of the [ComputedExpression](#) (recursively, if appropriate).

Returns

A [Tang::GarbageCollected](#) value for the new [ComputedExpression](#).

Reimplemented from [Tang::ComputedExpression](#).

The documentation for this class was generated from the following files:

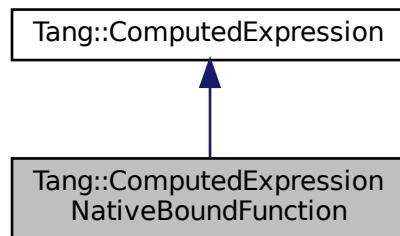
- [include/computedExpressionMap.hpp](#)
- [src/computedExpressionMap.cpp](#)

5.43 Tang::ComputedExpressionNativeBoundFunction Class Reference

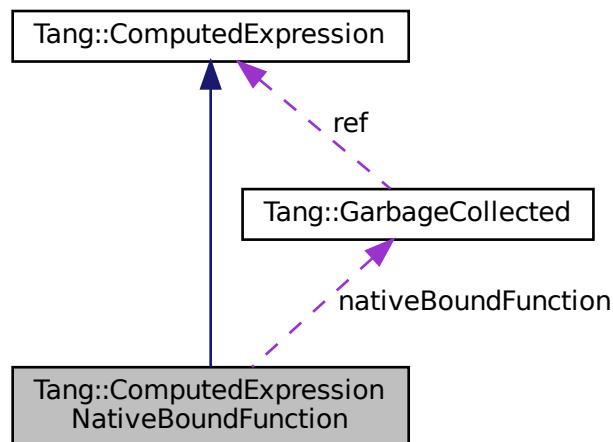
Represents a NativeBound Function declared in the script.

```
#include <computedExpressionNativeBoundFunction.hpp>
```

Inheritance diagram for Tang::ComputedExpressionNativeBoundFunction:



Collaboration diagram for Tang::ComputedExpressionNativeBoundFunction:



Public Member Functions

- [ComputedExpressionNativeBoundFunction](#) (`NativeBoundFunction nativeBoundFunction, size_t argc, std::type_index targetTypeIndex`)
Construct an NativeBoundFunction.
- `virtual std::string dump () const override`

- **Output the contents of the `ComputedExpression` as a string.**
- **GarbageCollected makeCopy () const override**
Make a copy of the `ComputedExpression` (recursively, if appropriate).
- **virtual GarbageCollected __equal (const GarbageCollected &rhs) const override**
Perform an equality test.
- **NativeBoundFunction getFunction () const**
Get the native bound function to be executed.
- **size_t getArgc () const**
Get the count of arguments that this function expects.
- **const std::type_index & getTargetTypeIndex () const**
Get the type of the value to which the function is bound.
- **virtual std::string __asCode () const**
Output the contents of the `ComputedExpression` as a string similar to how it would be represented as code.
- **virtual bool isCopyNeeded () const**
Determine whether or not a copy is needed.
- **virtual bool is_equal (const Tang::integer_t &val) const**
Check whether or not the computed expression is equal to another value.
- **virtual bool is_equal (const Tang::float_t &val) const**
Check whether or not the computed expression is equal to another value.
- **virtual bool is_equal (const bool &val) const**
Check whether or not the computed expression is equal to another value.
- **virtual bool is_equal (const std::string &val) const**
Check whether or not the computed expression is equal to another value.
- **virtual bool is_equal (const Error &val) const**
Check whether or not the computed expression is equal to another value.
- **virtual bool is_equal (const std::nullptr_t &val) const**
Check whether or not the computed expression is equal to another value.
- **virtual GarbageCollected __assign_index (const GarbageCollected &index, const GarbageCollected &value) const**
Perform an index assignment to the supplied value.
- **virtual GarbageCollected __add (const GarbageCollected &rhs) const**
Compute the result of adding this value and the supplied value.
- **virtual GarbageCollected __subtract (const GarbageCollected &rhs) const**
Compute the result of subtracting this value and the supplied value.
- **virtual GarbageCollected __multiply (const GarbageCollected &rhs) const**
Compute the result of multiplying this value and the supplied value.
- **virtual GarbageCollected __divide (const GarbageCollected &rhs) const**
Compute the result of dividing this value and the supplied value.
- **virtual GarbageCollected __modulo (const GarbageCollected &rhs) const**
Compute the result of moduloing this value and the supplied value.
- **virtual GarbageCollected __negative () const**
Compute the result of negating this value.
- **virtual GarbageCollected __not () const**
Compute the logical not of this value.
- **virtual GarbageCollected __lessThan (const GarbageCollected &rhs) const**
Compute the "less than" comparison.
- **virtual GarbageCollected __period (const GarbageCollected &member, std::shared_ptr<TangBase> &tang) const**
Perform a member access (period) operation.
- **virtual GarbageCollected __index (const GarbageCollected &index) const**
Perform an index operation.

- virtual `GarbageCollected __slice` (const `GarbageCollected &begin`, const `GarbageCollected &end`, const `GarbageCollected &skip`) const
Perform a slice operation.
- virtual `GarbageCollected __getIterator` (const `GarbageCollected &collection`) const
Get an iterator for the expression.
- virtual `GarbageCollected __iteratorNext` (size_t index=0) const
Get the next iterative value.
- virtual `GarbageCollected __integer` () const
Perform a type cast to integer.
- virtual `GarbageCollected __float` () const
Perform a type cast to float.
- virtual `GarbageCollected __boolean` () const
Perform a type cast to boolean.
- virtual `GarbageCollected __string` () const
Perform a type cast to string.

Public Attributes

- `std::optional< GarbageCollected > target`
The target object that the function is bound to.

Private Attributes

- `NativeBoundFunction nativeBoundFunction`
The native bound function to be executed.
- `size_t argc`
The count of arguments that this function expects.
- `std::type_index targetTypeIndex`
The type of the value to which the function is bound.

5.43.1 Detailed Description

Represents a NativeBound Function declared in the script.

5.43.2 Constructor & Destructor Documentation

5.43.2.1 ComputedExpressionNativeBoundFunction()

```
ComputedExpressionNativeBoundFunction::ComputedExpressionNativeBoundFunction (
    NativeBoundFunction nativeBoundFunction,
    size_t argc,
    std::type_index targetTypeIndex )
```

Construct an NativeBoundFunction.

The object itself is designed to be safe in that, once it is constructed, the method function pointer, argument count, and target type cannot be changed, but can only be accessible through a getter.

The target value that the function is bound to, however, cannot be set when the object is created, due to the design of the compiler. It is therefore exposed, regardless of being made public or via a setter function.

The current design of the VM will set the correct target, but because the target is exposed, it is possible that some bad actor could modify it. It is therefore necessary to verify that the type of the bound object and the type that was known when this object is created are, in fact, the same. That is why we store the target object type information and protect it behind a getter function.

When the VM executes the bound method, it will perform a type check to verify that the bound object is of the same type as that of the method that is defined in [TangBase::getObjectMethods\(\)](#).

It should be safe, then, to assume that within a NativeBoundFunction, the type is the expected type. No [ComputedExpression](#) type, then, should "steal" a NativeBoundFunction from another [ComputedExpression](#) definition, as it is assumed that the bound target that is provided to any NativeBoundFunction is the same as the type on which it was originally defined.

For example, a NativeBoundFunction declared in [ComputedExpressionString](#) may assume that the bound target is also a [ComputedExpressionString](#). If another class, such as [ComputedExpressionArray](#), were to try to copy the NativeBoundFunction (as a pointer reference), the function will still expect that the bound target is a [ComputedExpressionString](#), and will probably cause a segmentation fault. Just don't do it.

Parameters

<i>nativeBoundFunction</i>	The native bound function to be executed.
<i>argc</i>	The count of arguments that this function expects.
<i>targetTypeIndex</i>	The type of the value to which the function is bound.

5.43.3 Member Function Documentation

5.43.3.1 __add()

```
GarbageCollected ComputedExpression::__add (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of adding this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to add to this.
------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.43.3.2 [__asCode\(\)](#)

```
string ComputedExpression::__asCode ( ) const [virtual], [inherited]
```

Output the contents of the [ComputedExpression](#) as a string similar to how it would be represented as code.

Returns

A code-string representation of the computed expression.

Reimplemented in [Tang::ComputedExpressionString](#).

5.43.3.3 [__assign_index\(\)](#)

```
GarbageCollected ComputedExpression::__assign_index (
    const GarbageCollected & index,
    const GarbageCollected & value ) [virtual], [inherited]
```

Perform an index assignment to the supplied value.

Parameters

<i>index</i>	The index to which the value should be applied.
<i>value</i>	The value to store.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.43.3.4 __boolean()

```
GarbageCollected ComputedExpression::__boolean () const [virtual], [inherited]
```

Perform a type cast to boolean.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.43.3.5 __divide()

```
GarbageCollected ComputedExpression::__divide (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of dividing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to divide this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.43.3.6 __equal()

```
GarbageCollected ComputedExpressionNativeBoundFunction::__equal (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Perform an equality test.

Parameters

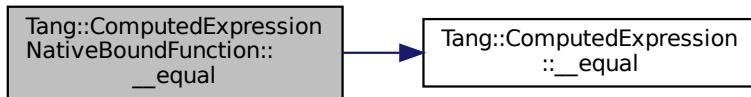
<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.43.3.7 __float()

`GarbageCollected ComputedExpression::__float () const [virtual], [inherited]`

Perform a type cast to float.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.43.3.8 __getIterator()

`GarbageCollected ComputedExpression::__getIterator (`
`const GarbageCollected & collection) const [virtual], [inherited]`

Get an iterator for the expression.

Parameters

<code>collection</code>	The <code>GarbageCollected</code> value that will serve as the collection through which to iterate.
-------------------------	---

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.43.3.9 __index()

`GarbageCollected ComputedExpression::__index (`
`const GarbageCollected & index) const [virtual], [inherited]`

Perform an index operation.

Parameters

<i>index</i>	The index expression provided by the script.
--------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.43.3.10 __integer()

`GarbageCollected ComputedExpression::__integer () const [virtual], [inherited]`

Perform a type cast to integer.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.43.3.11 __iteratorNext()

`GarbageCollected ComputedExpression::__iteratorNext (size_t index = 0) const [virtual], [inherited]`

Get the next iterative value.

Parameters

<i>index</i>	The desired index value.
--------------	--------------------------

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIterator](#), and [Tang::ComputedExpressionArray](#).

5.43.3.12 __lessThan()

`GarbageCollected ComputedExpression::__lessThan (const GarbageCollected & rhs) const [virtual], [inherited]`

Compute the "less than" comparison.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.43.3.13 __modulo()

```
GarbageCollected ComputedExpression::__modulo (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of moduloing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to modulo this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

5.43.3.14 __multiply()

```
GarbageCollected ComputedExpression::__multiply (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of multiplying this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to multiply to this.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.43.3.15 `__negative()`

```
GarbageCollected ComputedExpression::__negative ( ) const [virtual], [inherited]
```

Compute the result of negating this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.43.3.16 `__not()`

```
GarbageCollected ComputedExpression::__not ( ) const [virtual], [inherited]
```

Compute the logical not of this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.43.3.17 `__period()`

```
GarbageCollected ComputedExpression::__period (
    const GarbageCollected & member,
    std::shared_ptr< TangBase > & tang ) const [virtual], [inherited]
```

Perform a member access (period) operation.

Parameters

<code>member</code>	The member expression provided by the script.
---------------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionLibrary](#).

5.43.3.18 __slice()

```
GarbageCollected ComputedExpression::__slice (
    const GarbageCollected & begin,
    const GarbageCollected & end,
    const GarbageCollected & skip ) const [virtual], [inherited]
```

Perform a slice operation.

Convention will follow Python semantics, in which a slice will start at the provided index position, and go up to but not including the end index. The slice will default to an index increment of 1, but can be defined as another integer value.

Parameters

<i>begin</i>	The begin index expression provided by the script.
<i>end</i>	The end index expression provided by the script.
<i>skip</i>	The skip index expression provided by the script.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), and [Tang::ComputedExpressionArray](#).

5.43.3.19 __string()

```
GarbageCollected ComputedExpression::__string () const [virtual], [inherited]
```

Perform a type cast to string.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIteratorEnd](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionArray](#).

5.43.3.20 __subtract()

```
GarbageCollected ComputedExpression::__subtract (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of subtracting this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to subtract from this.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.43.3.21 dump()

```
string ComputedExpressionNativeBoundFunction::dump ( ) const [override], [virtual]
```

Output the contents of the [ComputedExpression](#) as a string.

Returns

A string representation of the computed expression.

Reimplemented from [Tang::ComputedExpression](#).

5.43.3.22 getArgc()

```
size_t ComputedExpressionNativeBoundFunction::getArgc ( ) const
```

Get the count of arguments that this function expects.

Returns

The count of arguments that this function expects.

5.43.3.23 getFunction()

```
NativeBoundFunction ComputedExpressionNativeBoundFunction::getFunction ( ) const
```

Get the native bound function to be executed.

Returns

The native bound function to be executed.

5.43.3.24 getTargetTypeIndex()

```
const type_index & ComputedExpressionNativeBoundFunction::getTargetTypeIndex ( ) const
```

Get the type of the value to which the function is bound.

Returns

The type of the value to which the function is bound.

5.43.3.25 is_equal() [1/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const bool & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionBoolean](#).

5.43.3.26 is_equal() [2/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Error & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionError](#).

5.43.3.27 `is_equal()` [3/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::nullptr_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

5.43.3.28 `is_equal()` [4/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::string & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#).

5.43.3.29 `is_equal()` [5/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::float_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.43.3.30 is_equal() [6/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::integer_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.43.3.31 isCopyNeeded()

```
bool ComputedExpression::isCopyNeeded ( ) const [virtual], [inherited]
```

Determine whether or not a copy is needed.

Copying is only required for ComputedExpressions which serve as containers, such as [ComputedExpressionArray](#) and [ComputedExpressionObject](#).

Returns

Whether or not a copy is needed.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.43.3.32 makeCopy()

```
GarbageCollected ComputedExpressionNativeBoundFunction::makeCopy ( ) const [override], [virtual]
```

Make a copy of the [ComputedExpression](#) (recursively, if appropriate).

Returns

A [Tang::GarbageCollected](#) value for the new [ComputedExpression](#).

Reimplemented from [Tang::ComputedExpression](#).

The documentation for this class was generated from the following files:

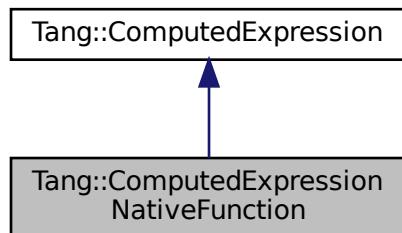
- include/computedExpressionNativeBoundFunction.hpp
- src/computedExpressionNativeBoundFunction.cpp

5.44 Tang::ComputedExpressionNativeFunction Class Reference

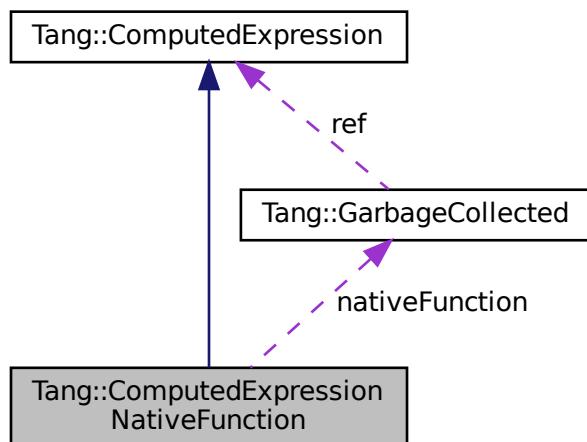
Represents a Native Function provided by compiled C++ code.

```
#include <computedExpressionNativeFunction.hpp>
```

Inheritance diagram for Tang::ComputedExpressionNativeFunction:



Collaboration diagram for Tang::ComputedExpressionNativeFunction:



Public Member Functions

- [ComputedExpressionNativeFunction \(NativeFunction nativeFunction, size_t argc\)](#)
Construct an NativeFunction.
- virtual std::string [dump \(\) const override](#)
Output the contents of the [ComputedExpression](#) as a string.

- `GarbageCollected makeCopy () const override`
Make a copy of the `ComputedExpression` (recursively, if appropriate).
- virtual `GarbageCollected __equal (const GarbageCollected &rhs) const override`
Perform an equality test.
- `NativeFunction getFunction () const`
Get the native bound function to be executed.
- `size_t getArgc () const`
Get the count of arguments that this function expects.
- virtual `std::string __asCode () const`
Output the contents of the `ComputedExpression` as a string similar to how it would be represented as code.
- virtual `bool isCopyNeeded () const`
Determine whether or not a copy is needed.
- virtual `bool is_equal (const Tang::integer_t &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal (const Tang::float_t &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal (const bool &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal (const std::string &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal (const Error &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `bool is_equal (const std::nullptr_t &val) const`
Check whether or not the computed expression is equal to another value.
- virtual `GarbageCollected __assign_index (const GarbageCollected &index, const GarbageCollected &value) const`
Perform an index assignment to the supplied value.
- virtual `GarbageCollected __add (const GarbageCollected &rhs) const`
Compute the result of adding this value and the supplied value.
- virtual `GarbageCollected __subtract (const GarbageCollected &rhs) const`
Compute the result of subtracting this value and the supplied value.
- virtual `GarbageCollected __multiply (const GarbageCollected &rhs) const`
Compute the result of multiplying this value and the supplied value.
- virtual `GarbageCollected __divide (const GarbageCollected &rhs) const`
Compute the result of dividing this value and the supplied value.
- virtual `GarbageCollected __modulo (const GarbageCollected &rhs) const`
Compute the result of moduloing this value and the supplied value.
- virtual `GarbageCollected __negative () const`
Compute the result of negating this value.
- virtual `GarbageCollected __not () const`
Compute the logical not of this value.
- virtual `GarbageCollected __lessThan (const GarbageCollected &rhs) const`
Compute the "less than" comparison.
- virtual `GarbageCollected __period (const GarbageCollected &member, std::shared_ptr<TangBase> &tang) const`
Perform a member access (period) operation.
- virtual `GarbageCollected __index (const GarbageCollected &index) const`
Perform an index operation.
- virtual `GarbageCollected __slice (const GarbageCollected &begin, const GarbageCollected &end, const GarbageCollected &skip) const`
Perform a slice operation.
- virtual `GarbageCollected __getIterator (const GarbageCollected &collection) const`

- virtual `GarbageCollected __iteratorNext (size_t index=0) const`
Get an iterator for the expression.
- virtual `GarbageCollected __integer () const`
Get the next iterative value.
- virtual `GarbageCollected __float () const`
Perform a type cast to float.
- virtual `GarbageCollected __boolean () const`
Perform a type cast to boolean.
- virtual `GarbageCollected __string () const`
Perform a type cast to string.

Private Attributes

- `NativeFunction nativeFunction`
The native bound function to be executed.
- `size_t argc`
The count of arguments that this function expects.

5.44.1 Detailed Description

Represents a Native Function provided by compiled C++ code.

5.44.2 Constructor & Destructor Documentation

5.44.2.1 ComputedExpressionNativeFunction()

```
ComputedExpressionNativeFunction::ComputedExpressionNativeFunction (
    NativeFunction nativeFunction,
    size_t argc )
```

Construct an NativeFunction.

The object itself is designed to be safe in that, once it is constructed, the method function pointer, and argument count cannot be changed, but can only be accessible through a getter.

Parameters

<code>nativeFunction</code>	The native function to be executed.
<code>argc</code>	The count of arguments that this function expects.

5.44.3 Member Function Documentation

5.44.3.1 __add()

```
GarbageCollected ComputedExpression::__add (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of adding this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to add to this.
------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.44.3.2 __asCode()

```
string ComputedExpression::__asCode ( ) const [virtual], [inherited]
```

Output the contents of the [ComputedExpression](#) as a string similar to how it would be represented as code.

Returns

A code-string representation of the computed expression.

Reimplemented in [Tang::ComputedExpressionString](#).

5.44.3.3 __assign_index()

```
GarbageCollected ComputedExpression::__assign_index (
    const GarbageCollected & index,
    const GarbageCollected & value ) [virtual], [inherited]
```

Perform an index assignment to the supplied value.

Parameters

<i>index</i>	The index to which the value should be applied.
<i>value</i>	The value to store.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.44.3.4 `__boolean()`

```
GarbageCollected ComputedExpression::__boolean () const [virtual], [inherited]
```

Perform a type cast to boolean.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.44.3.5 `__divide()`

```
GarbageCollected ComputedExpression::__divide (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of dividing this value and the supplied value.

Parameters

<code>rhs</code>	The GarbageCollected value to divide this by.
------------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.44.3.6 `__equal()`

```
GarbageCollected ComputedExpressionNativeFunction::__equal (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Perform an equality test.

Parameters

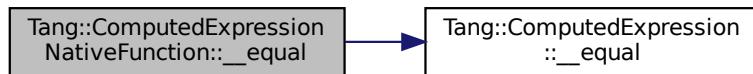
<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:

**5.44.3.7 __float()**

[GarbageCollected](#) `ComputedExpression::__float () const [virtual], [inherited]`

Perform a type cast to float.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.44.3.8 __getIterator()

[GarbageCollected](#) `ComputedExpression::__getIterator (`
`const GarbageCollected & collection) const [virtual], [inherited]`

Get an iterator for the expression.

Parameters

<i>collection</i>	The GarbageCollected value that will serve as the collection through which to iterate.
-------------------	--

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.44.3.9 __index()

```
GarbageCollected ComputedExpression::__index (
    const GarbageCollected & index ) const [virtual], [inherited]
```

Perform an index operation.

Parameters

<i>index</i>	The index expression provided by the script.
--------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.44.3.10 __integer()

```
GarbageCollected ComputedExpression::__integer () const [virtual], [inherited]
```

Perform a type cast to integer.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.44.3.11 __iteratorNext()

```
GarbageCollected ComputedExpression::__iteratorNext (
    size_t index = 0 ) const [virtual], [inherited]
```

Get the next iterative value.

Parameters

<i>index</i>	The desired index value.
--------------	--------------------------

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIterator](#), and [Tang::ComputedExpressionArray](#).

5.44.3.12 __lessThan()

```
GarbageCollected ComputedExpression::__lessThan (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the "less than" comparison.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.44.3.13 __modulo()

```
GarbageCollected ComputedExpression::__modulo (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of moduloing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to modulo this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

5.44.3.14 __multiply()

```
GarbageCollected ComputedExpression::__multiply (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of multiplying this value and the supplied value.

Parameters

<code>rhs</code>	The GarbageCollected value to multiply to this.
------------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.44.3.15 `__negative()`

[GarbageCollected](#) `ComputedExpression::__negative () const [virtual], [inherited]`

Compute the result of negating this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.44.3.16 `__not()`

[GarbageCollected](#) `ComputedExpression::__not () const [virtual], [inherited]`

Compute the logical not of this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.44.3.17 `__period()`

[GarbageCollected](#) `ComputedExpression::__period (`
 `const GarbageCollected & member,`
 `std::shared_ptr< TangBase > & tang) const [virtual], [inherited]`

Perform a member access (period) operation.

Parameters

<i>member</i>	The member expression provided by the script.
---------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionLibrary](#).

5.44.3.18 __slice()

```
GarbageCollected ComputedExpression::__slice (
    const GarbageCollected & begin,
    const GarbageCollected & end,
    const GarbageCollected & skip ) const [virtual], [inherited]
```

Perform a slice operation.

Convention will follow Python semantics, in which a slice will start at the provided index position, and go up to but not including the end index. The slice will default to an index increment of 1, but can be defined as another integer value.

Parameters

<i>begin</i>	The begin index expression provided by the script.
<i>end</i>	The end index expression provided by the script.
<i>skip</i>	The skip index expression provided by the script.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), and [Tang::ComputedExpressionArray](#).

5.44.3.19 __string()

```
GarbageCollected ComputedExpression::__string ( ) const [virtual], [inherited]
```

Perform a type cast to string.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIteratorEnd](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionArray](#).

5.44.3.20 `__subtract()`

```
GarbageCollected ComputedExpression::__subtract (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of subtracting this value and the supplied value.

Parameters

<code>rhs</code>	The <code>GarbageCollected</code> value to subtract from this.
------------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.44.3.21 `dump()`

```
string ComputedExpressionNativeFunction::dump () const [override], [virtual]
```

Output the contents of the `ComputedExpression` as a string.

Returns

A string representation of the computed expression.

Reimplemented from [Tang::ComputedExpression](#).

5.44.3.22 `getArgc()`

```
size_t ComputedExpressionNativeFunction::getArgc () const
```

Get the count of arguments that this function expects.

Returns

The count of arguments that this function expects.

5.44.3.23 `getFunction()`

```
NativeFunction ComputedExpressionNativeFunction::getFunction ( ) const
```

Get the native bound function to be executed.

Returns

The native bound function to be executed.

5.44.3.24 `is_equal()` [1/6]

```
virtual bool Tang::ComputedExpression::is_equal (  
    const bool & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionBoolean](#).

5.44.3.25 is_equal() [2/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Error & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionError](#).

5.44.3.26 is_equal() [3/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::nullptr_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

5.44.3.27 is_equal() [4/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::string & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#).

5.44.3.28 is_equal() [5/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::float_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.44.3.29 is_equal() [6/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::integer_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.44.3.30 isCopyNeeded()

```
bool ComputedExpression::isCopyNeeded ( ) const [virtual], [inherited]
```

Determine whether or not a copy is needed.

Copying is only required for ComputedExpressions which serve as containers, such as [ComputedExpressionArray](#) and [ComputedExpressionObject](#).

Returns

Whether or not a copy is needed.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.44.3.31 makeCopy()

```
GarbageCollected ComputedExpressionNativeFunction::makeCopy ( ) const [override], [virtual]
```

Make a copy of the [ComputedExpression](#) (recursively, if appropriate).

Returns

A [Tang::GarbageCollected](#) value for the new [ComputedExpression](#).

Reimplemented from [Tang::ComputedExpression](#).

The documentation for this class was generated from the following files:

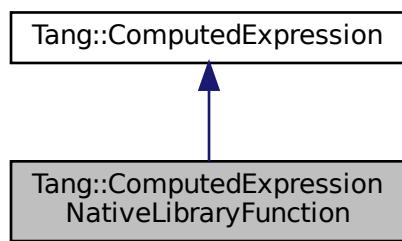
- include/computedExpressionNativeFunction.hpp
- src/computedExpressionNativeFunction.cpp

5.45 Tang::ComputedExpressionNativeLibraryFunction Class Reference

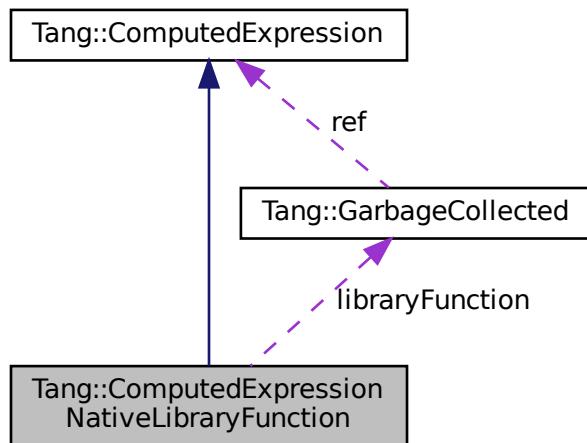
Represents a Native Function provided by compiled C++ code that is executed to create a library or one of its attributes.

```
#include <computedExpressionNativeLibraryFunction.hpp>
```

Inheritance diagram for Tang::ComputedExpressionNativeLibraryFunction:



Collaboration diagram for Tang::ComputedExpressionNativeLibraryFunction:



Public Member Functions

- [ComputedExpressionNativeLibraryFunction \(LibraryFunction nativeFunction\)](#)
Construct a NativeLibraryFunction.
- virtual std::string [dump \(\) const](#) override

- **`Output the contents of the ComputedExpression as a string.`**
- **`GarbageCollected makeCopy () const override`**

*Make a copy of the *ComputedExpression* (recursively, if appropriate).*
- **`virtual GarbageCollected __equal (const GarbageCollected &rhs) const override`**

Perform an equality test.
- **`LibraryFunction getFunction () const`**

Get the native bound function to be executed.
- **`virtual std::string __asCode () const`**

*Output the contents of the *ComputedExpression* as a string similar to how it would be represented as code.*
- **`virtual bool isCopyNeeded () const`**

Determine whether or not a copy is needed.
- **`virtual bool is_equal (const Tang::integer_t &val) const`**

Check whether or not the computed expression is equal to another value.
- **`virtual bool is_equal (const Tang::float_t &val) const`**

Check whether or not the computed expression is equal to another value.
- **`virtual bool is_equal (const bool &val) const`**

Check whether or not the computed expression is equal to another value.
- **`virtual bool is_equal (const std::string &val) const`**

Check whether or not the computed expression is equal to another value.
- **`virtual bool is_equal (const Error &val) const`**

Check whether or not the computed expression is equal to another value.
- **`virtual bool is_equal (const std::nullptr_t &val) const`**

Check whether or not the computed expression is equal to another value.
- **`virtual GarbageCollected __assign_index (const GarbageCollected &index, const GarbageCollected &value)`**

Perform an index assignment to the supplied value.
- **`virtual GarbageCollected __add (const GarbageCollected &rhs) const`**

Compute the result of adding this value and the supplied value.
- **`virtual GarbageCollected __subtract (const GarbageCollected &rhs) const`**

Compute the result of subtracting this value and the supplied value.
- **`virtual GarbageCollected __multiply (const GarbageCollected &rhs) const`**

Compute the result of multiplying this value and the supplied value.
- **`virtual GarbageCollected __divide (const GarbageCollected &rhs) const`**

Compute the result of dividing this value and the supplied value.
- **`virtual GarbageCollected __modulo (const GarbageCollected &rhs) const`**

Compute the result of moduloloing this value and the supplied value.
- **`virtual GarbageCollected __negative () const`**

Compute the result of negating this value.
- **`virtual GarbageCollected __not () const`**

Compute the logical not of this value.
- **`virtual GarbageCollected __lessThan (const GarbageCollected &rhs) const`**

Compute the "less than" comparison.
- **`virtual GarbageCollected __period (const GarbageCollected &member, std::shared_ptr< TangBase > &tang) const`**

Perform a member access (period) operation.
- **`virtual GarbageCollected __index (const GarbageCollected &index) const`**

Perform an index operation.
- **`virtual GarbageCollected __slice (const GarbageCollected &begin, const GarbageCollected &end, const GarbageCollected &skip) const`**

Perform a slice operation.
- **`virtual GarbageCollected __getIterator (const GarbageCollected &collection) const`**

Get an iterator for the expression.

- virtual `GarbageCollected __iteratorNext (size_t index=0) const`
Get the next iterative value.
- virtual `GarbageCollected __integer () const`
Perform a type cast to integer.
- virtual `GarbageCollected __float () const`
Perform a type cast to float.
- virtual `GarbageCollected __boolean () const`
Perform a type cast to boolean.
- virtual `GarbageCollected __string () const`
Perform a type cast to string.

Private Attributes

- `LibraryFunction libraryFunction`
The library function to be executed.

5.45.1 Detailed Description

Represents a Native Function provided by compiled C++ code that is executed to create a library or one of its attributes.

The purpose of this function is to be able to construct a library or the library attributes as needed at runtime.

5.45.2 Constructor & Destructor Documentation

5.45.2.1 ComputedExpressionNativeLibraryFunction()

```
ComputedExpressionNativeLibraryFunction::ComputedExpressionNativeLibraryFunction (
    LibraryFunction nativeFunction )
```

Construct a NativeLibraryFunction.

Parameters

<code>libraryFunction</code>	The library function to be executed.
------------------------------	--------------------------------------

5.45.3 Member Function Documentation

5.45.3.1 __add()

```
GarbageCollected ComputedExpression::__add (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of adding this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to add to this.
------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.45.3.2 `__asCode()`

```
string ComputedExpression::__asCode ( ) const [virtual], [inherited]
```

Output the contents of the [ComputedExpression](#) as a string similar to how it would be represented as code.

Returns

A code-string representation of the computed expression.

Reimplemented in [Tang::ComputedExpressionString](#).

5.45.3.3 `__assign_index()`

```
GarbageCollected ComputedExpression::__assign_index (
    const GarbageCollected & index,
    const GarbageCollected & value ) [virtual], [inherited]
```

Perform an index assignment to the supplied value.

Parameters

<i>index</i>	The index to which the value should be applied.
<i>value</i>	The value to store.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.45.3.4 __boolean()

```
GarbageCollected ComputedExpression::__boolean ( ) const [virtual], [inherited]
```

Perform a type cast to boolean.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.45.3.5 __divide()

```
GarbageCollected ComputedExpression::__divide (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of dividing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to divide this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.45.3.6 __equal()

```
GarbageCollected ComputedExpressionNativeLibraryFunction::__equal (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Perform an equality test.

Parameters

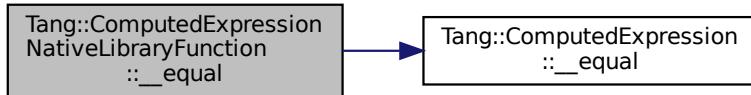
<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.45.3.7 __float()

`GarbageCollected` `ComputedExpression::__float () const [virtual], [inherited]`

Perform a type cast to float.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.45.3.8 __getIterator()

`GarbageCollected` `ComputedExpression::__getIterator (`
`const GarbageCollected & collection) const [virtual], [inherited]`

Get an iterator for the expression.

Parameters

<code>collection</code>	The <code>GarbageCollected</code> value that will serve as the collection through which to iterate.
-------------------------	---

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.45.3.9 __index()

`GarbageCollected` `ComputedExpression::__index (`
`const GarbageCollected & index) const [virtual], [inherited]`

Perform an index operation.

Parameters

<i>index</i>	The index expression provided by the script.
--------------	--

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.45.3.10 __integer()

`GarbageCollected ComputedExpression::__integer () const [virtual], [inherited]`

Perform a type cast to integer.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.45.3.11 __iteratorNext()

`GarbageCollected ComputedExpression::__iteratorNext (size_t index = 0) const [virtual], [inherited]`

Get the next iterative value.

Parameters

<i>index</i>	The desired index value.
--------------	--------------------------

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIterator](#), and [Tang::ComputedExpressionArray](#).

5.45.3.12 __lessThan()

`GarbageCollected ComputedExpression::__lessThan (const GarbageCollected & rhs) const [virtual], [inherited]`

Compute the "less than" comparison.

Parameters

<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.45.3.13 __modulo()

```
GarbageCollected ComputedExpression::__modulo (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of moduloing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to modulo this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

5.45.3.14 __multiply()

```
GarbageCollected ComputedExpression::__multiply (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of multiplying this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to multiply to this.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.45.3.15 `__negative()`

```
GarbageCollected ComputedExpression::__negative ( ) const [virtual], [inherited]
```

Compute the result of negating this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.45.3.16 `__not()`

```
GarbageCollected ComputedExpression::__not ( ) const [virtual], [inherited]
```

Compute the logical not of this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.45.3.17 `__period()`

```
GarbageCollected ComputedExpression::__period (
    const GarbageCollected & member,
    std::shared_ptr< TangBase > & tang ) const [virtual], [inherited]
```

Perform a member access (period) operation.

Parameters

<code>member</code>	The member expression provided by the script.
---------------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionLibrary](#).

5.45.3.18 __slice()

```
GarbageCollected ComputedExpression::__slice (
    const GarbageCollected & begin,
    const GarbageCollected & end,
    const GarbageCollected & skip ) const [virtual], [inherited]
```

Perform a slice operation.

Convention will follow Python semantics, in which a slice will start at the provided index position, and go up to but not including the end index. The slice will default to an index increment of 1, but can be defined as another integer value.

Parameters

<i>begin</i>	The begin index expression provided by the script.
<i>end</i>	The end index expression provided by the script.
<i>skip</i>	The skip index expression provided by the script.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), and [Tang::ComputedExpressionArray](#).

5.45.3.19 __string()

```
GarbageCollected ComputedExpression::__string () const [virtual], [inherited]
```

Perform a type cast to string.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionMap](#), [Tang::ComputedExpressionIteratorEnd](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionArray](#).

5.45.3.20 __subtract()

```
GarbageCollected ComputedExpression::__subtract (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of subtracting this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to subtract from this.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.45.3.21 `dump()`

```
string ComputedExpressionNativeLibraryFunction::dump ( ) const [override], [virtual]
```

Output the contents of the [ComputedExpression](#) as a string.

Returns

A string representation of the computed expression.

Reimplemented from [Tang::ComputedExpression](#).

5.45.3.22 `getFunction()`

```
LibraryFunction ComputedExpressionNativeLibraryFunction::getFunction ( ) const
```

Get the native bound function to be executed.

Returns

The native bound function to be executed.

5.45.3.23 `is_equal()` [1/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const bool & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionBoolean](#).

5.45.3.24 is_equal() [2/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Error & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionError](#).

5.45.3.25 is_equal() [3/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::nullptr_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

5.45.3.26 is_equal() [4/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::string & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionString](#).

5.45.3.27 is_equal() [5/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::float_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.45.3.28 is_equal() [6/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::integer_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.45.3.29 isCopyNeeded()

```
bool ComputedExpression::isCopyNeeded ( ) const [virtual], [inherited]
```

Determine whether or not a copy is needed.

Copying is only required for ComputedExpressions which serve as containers, such as [ComputedExpressionArray](#) and [ComputedExpressionObject](#).

Returns

Whether or not a copy is needed.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.45.3.30 makeCopy()

```
GarbageCollected ComputedExpressionNativeLibraryFunction::makeCopy ( ) const [override], [virtual]
```

Make a copy of the [ComputedExpression](#) (recursively, if appropriate).

Returns

A [Tang::GarbageCollected](#) value for the new [ComputedExpression](#).

Reimplemented from [Tang::ComputedExpression](#).

The documentation for this class was generated from the following files:

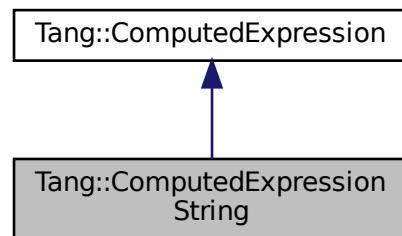
- [include/computedExpressionNativeLibraryFunction.hpp](#)
- [src/computedExpressionNativeLibraryFunction.cpp](#)

5.46 Tang::ComputedExpressionString Class Reference

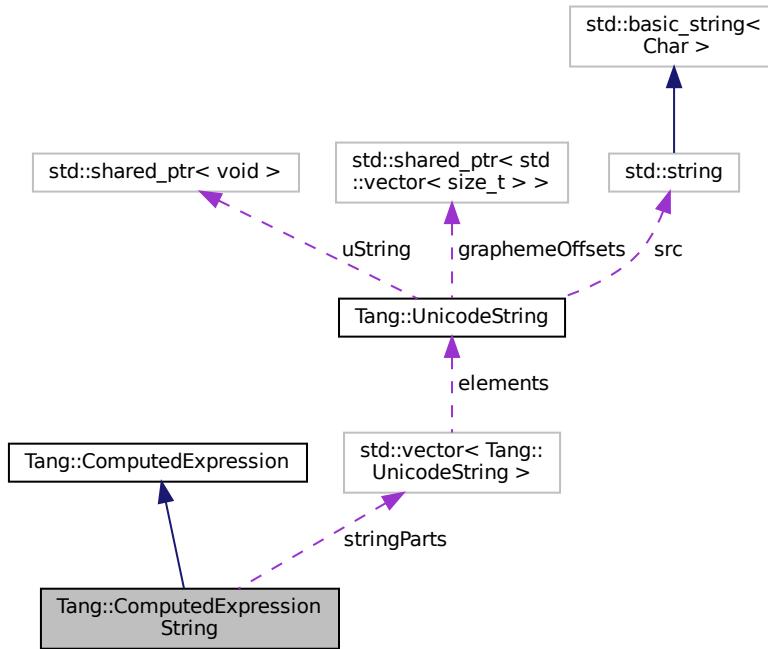
Represents a String that is the result of a computation.

```
#include <computedExpressionString.hpp>
```

Inheritance diagram for Tang::ComputedExpressionString:



Collaboration diagram for Tang::ComputedExpressionString:



Public Member Functions

- **ComputedExpressionString (const std::string &val)**
Construct a String result.
- **ComputedExpressionString (const std::vector<UnicodeString> &stringParts)**
Construct a String result from a vector of [UnicodeString](#) objects.
- virtual std::string **dump () const override**
Output the contents of the [ComputedExpression](#) as a string.
- virtual std::string **_asCode () const override**
Output the contents of the [ComputedExpression](#) as a string similar to how it would be represented as code.
- **GarbageCollected makeCopy () const override**
Make a copy of the [ComputedExpression](#) (recursively, if appropriate).
- virtual bool **is_equal (const bool &val) const override**
Check whether or not the computed expression is equal to another value.
- virtual bool **is_equal (const std::string &val) const override**
Check whether or not the computed expression is equal to another value.
- virtual **GarbageCollected __index (const GarbageCollected &index) const override**
Perform an index operation.
- virtual **GarbageCollected __slice (const GarbageCollected &begin, const GarbageCollected &end, const GarbageCollected &skip) const override**
Perform a slice operation.
- virtual **GarbageCollected __getIterator (const GarbageCollected &collection) const override**
Get an iterator for the expression.
- virtual **GarbageCollected __iteratorNext (size_t index) const override**

- Get the next iterative value.*
- virtual `GarbageCollected __add` (const `GarbageCollected` &rhs) const override

Compute the result of adding this value and the supplied value.
 - virtual `GarbageCollected __not` () const override

Compute the logical not of this value.
 - virtual `GarbageCollected __lessThan` (const `GarbageCollected` &rhs) const override

Compute the "less than" comparison.
 - virtual `GarbageCollected __equal` (const `GarbageCollected` &rhs) const override

Perform an equality test.
 - virtual `GarbageCollected __boolean` () const override

Perform a type cast to boolean.
 - virtual `GarbageCollected __string` () const override

Perform a type cast to string.
 - const std::vector< `UnicodeString` > & `getValue` () const

Return the collection of string values that are stored in this object.
 - size_t `length` () const

Return the number of graphemes contained in the string.
 - size_t `bytesLength` () const

Return the number of bytes required by the string, stored as UTF-8.
 - `ComputedExpressionString` & `operator+=` (const `ComputedExpressionString` &rhs)

Helper function to copy the contents of the rhs string into the current string.
 - void `setUntrusted` ()

Set all of the string parts to `UnicodeString::Type::Untrusted`.
 - void `setPercent` ()

Set all of the string parts to `UnicodeString::Type::Percent`.
 - virtual bool `isCopyNeeded` () const

Determine whether or not a copy is needed.
 - virtual bool `is_equal` (const `Tang::integer_t` &val) const

Check whether or not the computed expression is equal to another value.
 - virtual bool `is_equal` (const `Tang::float_t` &val) const

Check whether or not the computed expression is equal to another value.
 - virtual bool `is_equal` (const `Error` &val) const

Check whether or not the computed expression is equal to another value.
 - virtual bool `is_equal` (const std::nullptr_t &val) const

Check whether or not the computed expression is equal to another value.
 - virtual `GarbageCollected __assign_index` (const `GarbageCollected` &index, const `GarbageCollected` &value)

Perform an index assignment to the supplied value.
 - virtual `GarbageCollected __subtract` (const `GarbageCollected` &rhs) const

Compute the result of subtracting this value and the supplied value.
 - virtual `GarbageCollected __multiply` (const `GarbageCollected` &rhs) const

Compute the result of multiplying this value and the supplied value.
 - virtual `GarbageCollected __divide` (const `GarbageCollected` &rhs) const

Compute the result of dividing this value and the supplied value.
 - virtual `GarbageCollected __modulo` (const `GarbageCollected` &rhs) const

Compute the result of moduloing this value and the supplied value.
 - virtual `GarbageCollected __negative` () const

Compute the result of negating this value.
 - virtual `GarbageCollected __period` (const `GarbageCollected` &member, std::shared_ptr< `TangBase` > &tang) const

Perform a member access (period) operation.
 - virtual `GarbageCollected __integer` () const

Perform a type cast to integer.
 - virtual `GarbageCollected __float` () const

Perform a type cast to float.

Static Public Member Functions

- static `NativeBoundFunctionMap getMethods ()`
Return the member functions implemented for this particular expression type.

Private Attributes

- `std::vector< UnicodeString > stringParts`
The string value.
- `std::optional< size_t > cachedLength`
Cache of the string length in graphemes.
- `std::optional< size_t > cachedBytesLength`
Cache of the string length in bytes.

5.46.1 Detailed Description

Represents a String that is the result of a computation.

5.46.2 Constructor & Destructor Documentation

5.46.2.1 ComputedExpressionString() [1/2]

```
ComputedExpressionString::ComputedExpressionString (
    const std::string & val )
```

Construct a String result.

Parameters

<code>val</code>	The string value.
------------------	-------------------

5.46.2.2 ComputedExpressionString() [2/2]

```
ComputedExpressionString::ComputedExpressionString (
    const std::vector< UnicodeString > & stringParts )
```

Construct a String result from a vector of `UnicodeString` objects.

Parameters

<code>stringParts</code>	The vector of <code>UnicodeString</code> objects.
--------------------------	---

5.46.3 Member Function Documentation

5.46.3.1 __add()

```
GarbageCollected ComputedExpressionString::__add (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the result of adding this value and the supplied value.

Parameters

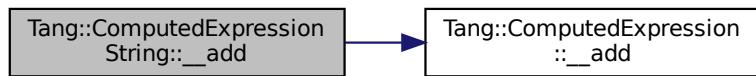
<i>rhs</i>	The GarbageCollected value to add to this.
------------	--

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.46.3.2 __asCode()

```
string ComputedExpressionString::__asCode ( ) const [override], [virtual]
```

Output the contents of the [ComputedExpression](#) as a string similar to how it would be represented as code.

Returns

A code-string representation of the computed expression.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:

**5.46.3.3 __assign_index()**

```
GarbageCollected ComputedExpression::__assign_index (
    const GarbageCollected & index,
    const GarbageCollected & value ) [virtual], [inherited]
```

Perform an index assignment to the supplied value.

Parameters

<i>index</i>	The index to which the value should be applied.
<i>value</i>	The value to store.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.46.3.4 __boolean()

```
GarbageCollected ComputedExpressionString::__boolean () const [override], [virtual]
```

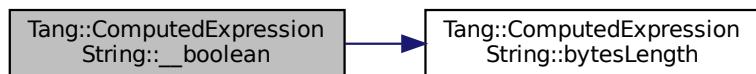
Perform a type cast to boolean.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.46.3.5 __divide()

```
GarbageCollected ComputedExpression::__divide (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of dividing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to divide this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.46.3.6 __equal()

```
GarbageCollected ComputedExpressionString::__equal (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Perform an equality test.

Parameters

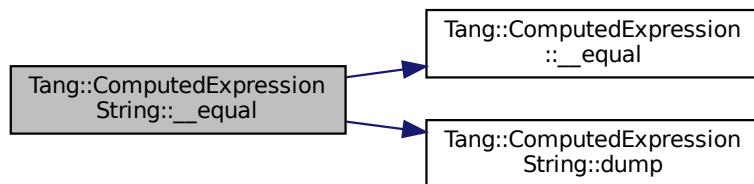
<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:

**5.46.3.7 __float()**

[GarbageCollected](#) `ComputedExpression::__float () const [virtual], [inherited]`

Perform a type cast to float.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.46.3.8 __getIterator()

```

GarbageCollected ComputedExpressionString::__getIterator (
    const GarbageCollected & collection ) const [override], [virtual]

```

Get an iterator for the expression.

Parameters

<code>collection</code>	The GarbageCollected value that will serve as the collection through which to iterate.
-------------------------	--

Reimplemented from [Tang::ComputedExpression](#).

5.46.3.9 __index()

```
GarbageCollected ComputedExpressionString::__index (
    const GarbageCollected & index ) const [override], [virtual]
```

Perform an index operation.

Parameters

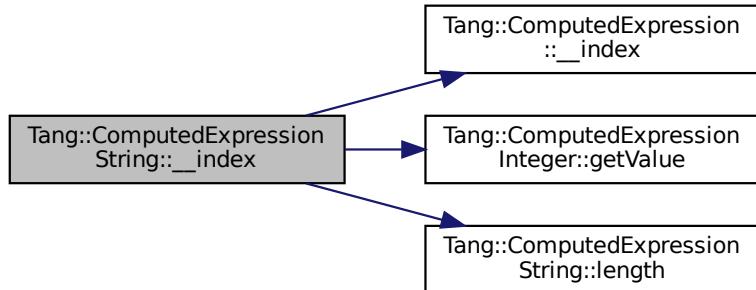
<i>index</i>	The index expression provided by the script.
--------------	--

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.46.3.10 __integer()

```
GarbageCollected ComputedExpression::__integer ( ) const [virtual], [inherited]
```

Perform a type cast to integer.

Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

5.46.3.11 __iteratorNext()

```
GarbageCollected ComputedExpressionString::__iteratorNext (
    size_t index ) const [override], [virtual]
```

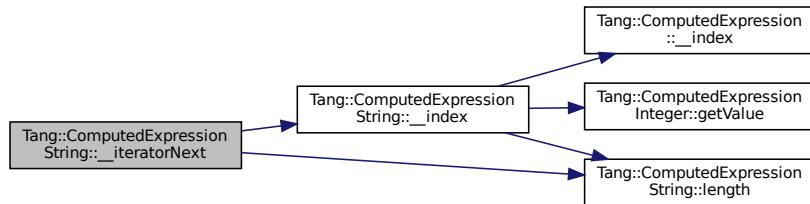
Get the next iterative value.

Parameters

<i>index</i>	The desired index value.
--------------	--------------------------

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.46.3.12 __lessThan()

```
GarbageCollected ComputedExpressionString::__lessThan (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the "less than" comparison.

Parameters

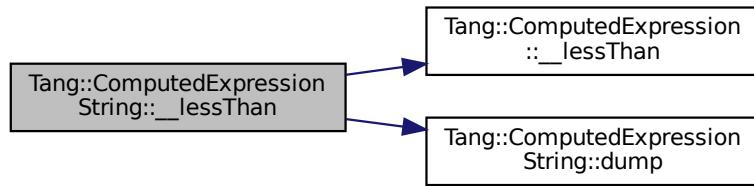
<i>rhs</i>	The GarbageCollected value to compare against.
------------	--

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.46.3.13 __modulo()

```
GarbageCollected ComputedExpression::__modulo (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of moduloing this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to modulo this by.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

5.46.3.14 __multiply()

```
GarbageCollected ComputedExpression::__multiply (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of multiplying this value and the supplied value.

Parameters

<i>rhs</i>	The GarbageCollected value to multiply to this.
------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.46.3.15 __negative()

```
GarbageCollected ComputedExpression::__negative () const [virtual], [inherited]
```

Compute the result of negating this value.

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.46.3.16 __not()

```
GarbageCollected ComputedExpressionString::__not () const [override], [virtual]
```

Compute the logical not of this value.

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:

**5.46.3.17 __period()**

```
GarbageCollected ComputedExpression::__period (
    const GarbageCollected & member,
    std::shared_ptr< TangBase > & tang ) const [virtual], [inherited]
```

Perform a member access (period) operation.

Parameters

<i>member</i>	The member expression provided by the script.
---------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionLibrary](#).

5.46.3.18 __slice()

```
GarbageCollected ComputedExpressionString::__slice (
    const GarbageCollected & begin,
    const GarbageCollected & end,
    const GarbageCollected & skip ) const [override], [virtual]
```

Perform a slice operation.

Convention will follow Python semantics, in which a slice will start at the provided index position, and go up to but not including the end index. The slice will default to an index increment of 1, but can be defined as another integer value.

Parameters

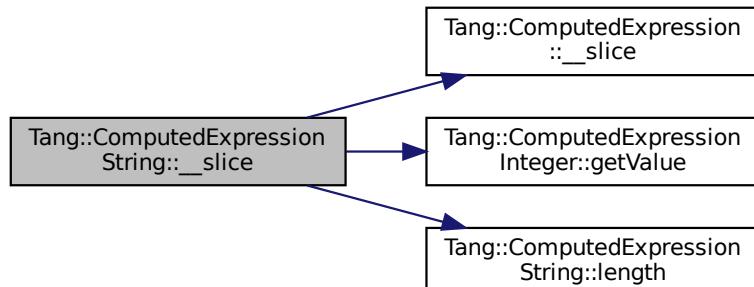
<i>begin</i>	The begin index expression provided by the script.
<i>end</i>	The end index expression provided by the script.
<i>skip</i>	The skip index expression provided by the script.

Returns

The result of the operation.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:



5.46.3.19 `__string()`

```
GarbageCollected ComputedExpressionString::__string () const [override], [virtual]
```

Perform a type cast to string.

Returns

The result of the the operation.

Reimplemented from [Tang::ComputedExpression](#).

5.46.3.20 `__subtract()`

```
GarbageCollected ComputedExpression::__subtract (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the result of subtracting this value and the supplied value.

Parameters

<code>rhs</code>	The GarbageCollected value to subtract from this.
------------------	---

Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.46.3.21 `bytesLength()`

```
size_t ComputedExpressionString::bytesLength () const
```

Return the number of bytes required by the string, stored as UTF-8.

Returns

The number of bytes required by the string, stored as UTF-8.

5.46.3.22 dump()

```
string ComputedExpressionString::dump ( ) const [override], [virtual]
```

Output the contents of the [ComputedExpression](#) as a string.

Returns

A string representation of the computed expression.

Reimplemented from [Tang::ComputedExpression](#).

5.46.3.23 getMethods()

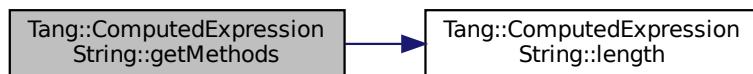
```
NativeBoundFunctionMap ComputedExpressionString::getMethods ( ) [static]
```

Return the member functions implemented for this particular expression type.

Returns

The member functions implemented.

Here is the call graph for this function:



5.46.3.24 getValue()

```
const vector< UnicodeString > & ComputedExpressionString::getValue ( ) const
```

Return the collection of string values that are stored in this object.

Returns

The collection of string values.

5.46.3.25 is_equal() [1/6]

```
bool ComputedExpressionString::is_equal (
    const bool & val ) const [override], [virtual]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:

**5.46.3.26 is_equal() [2/6]**

```
virtual bool Tang::ComputedExpression::is_equal (
    const Error & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionError](#).

5.46.3.27 is_equal() [3/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const std::nullptr_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

5.46.3.28 `is_equal()` [4/6]

```
bool ComputedExpressionString::is_equal (
    const std::string & val ) const [override], [virtual]
```

Check whether or not the computed expression is equal to another value.

Parameters

<code>val</code>	The value to compare against.
------------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented from [Tang::ComputedExpression](#).

Here is the call graph for this function:

**5.46.3.29 `is_equal()` [5/6]**

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::float_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.46.3.30 is_equal() [6/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const Tang::integer_t & val ) const [virtual], [inherited]
```

Check whether or not the computed expression is equal to another value.

Parameters

<i>val</i>	The value to compare against.
------------	-------------------------------

Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

5.46.3.31 isCopyNeeded()

```
bool ComputedExpression::isCopyNeeded ( ) const [virtual], [inherited]
```

Determine whether or not a copy is needed.

Copying is only required for ComputedExpressions which serve as containers, such as [ComputedExpressionArray](#) and [ComputedExpressionObject](#).

Returns

Whether or not a copy is needed.

Reimplemented in [Tang::ComputedExpressionMap](#), and [Tang::ComputedExpressionArray](#).

5.46.3.32 length()

```
size_t ComputedExpressionString::length ( ) const
```

Return the number of graphemes contained in the string.

Returns

The number of graphemes contained in the string.

5.46.3.33 makeCopy()

```
GarbageCollected ComputedExpressionString::makeCopy ( ) const [override], [virtual]
```

Make a copy of the [ComputedExpression](#) (recursively, if appropriate).

Returns

A [Tang::GarbageCollected](#) value for the new [ComputedExpression](#).

Reimplemented from [Tang::ComputedExpression](#).

5.46.3.34 operator+=()

```
ComputedExpressionString & ComputedExpressionString::operator+= ( const ComputedExpressionString & rhs )
```

Helper function to copy the contents of the rhs string into the current string.

Parameters

<i>rhs</i>	The right hand side of the operation.
------------	---------------------------------------

Returns

The result of the operation.

The documentation for this class was generated from the following files:

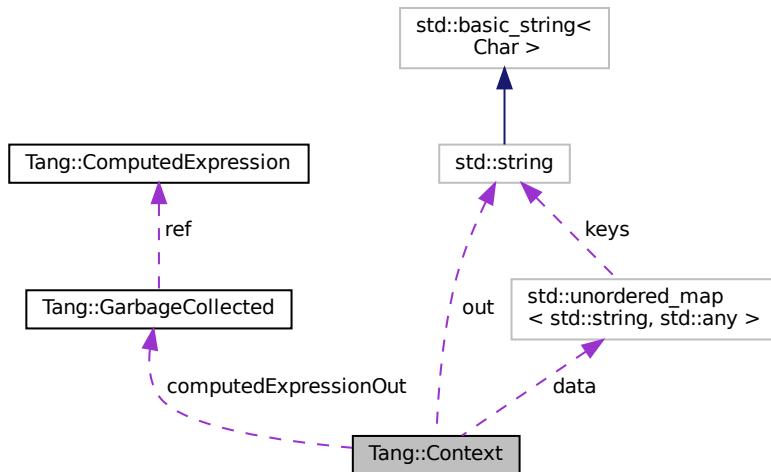
- include/computedExpressionString.hpp
- src/computedExpressionString.cpp

5.47 Tang::Context Class Reference

Holds all environment variables specific to the execution of a program.

```
#include <context.hpp>
```

Collaboration diagram for Tang::Context:



Public Member Functions

- [Context \(ContextData &&data\)](#)

Default constructor.

Public Attributes

- [ContextData data](#)
Holds arbitrary data for use in the program execution.
- [std::string out](#)
The output result from the program execution.
- [GarbageCollected computedExpressionOut](#)
The output result from the program execution, as a `ComputedExpressionString`.
- [std::optional<GarbageCollected> result](#)
The result of the `Program` execution.

5.47.1 Detailed Description

Holds all environment variables specific to the execution of a program.

The documentation for this class was generated from the following files:

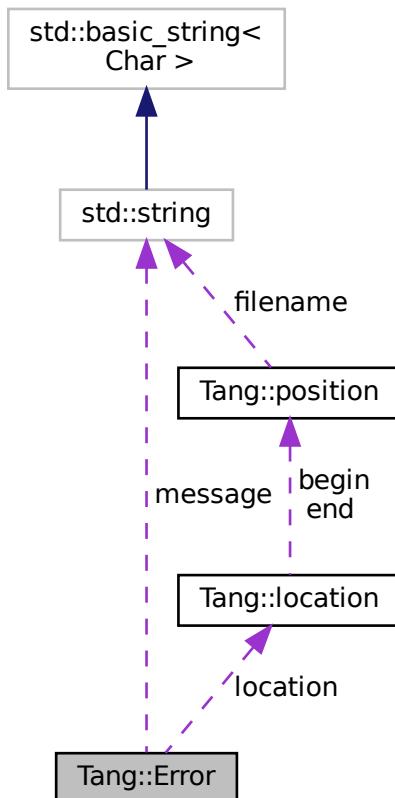
- include/context.hpp
- src/context.cpp

5.48 Tang::Error Class Reference

The [Error](#) class is used to report any error of the system, whether a syntax (parsing) error or a runtime (execution) error.

```
#include <error.hpp>
```

Collaboration diagram for Tang::Error:



Public Member Functions

- [Error \(\)](#)
Creates an empty error message.
- [Error \(std::string message\)](#)
Creates an error message using the supplied error string and location.
- [Error \(std::string message, Tang::location location\)](#)
Creates an error message using the supplied error string and location.

Public Attributes

- std::string [message](#)
The error message as a string.
- Tang::location [location](#)
The location of the error.

Friends

- std::ostream & `operator<<` (std::ostream &out, const Error &error)
Add friendly output.

5.48.1 Detailed Description

The `Error` class is used to report any error of the system, whether a syntax (parsing) error or a runtime (execution) error.

5.48.2 Constructor & Destructor Documentation

5.48.2.1 Error() [1/2]

```
Tang::Error::Error (
    std::string message ) [inline]
```

Creates an error message using the supplied error string and location.

Parameters

<code>message</code>	The error message as a string.
----------------------	--------------------------------

5.48.2.2 Error() [2/2]

```
Tang::Error::Error (
    std::string message,
    Tang::location location ) [inline]
```

Creates an error message using the supplied error string and location.

Parameters

<code>message</code>	The error message as a string.
<code>location</code>	The location of the error.

5.48.3 Friends And Related Function Documentation

5.48.3.1 operator<<

```
std::ostream& operator<< (
    std::ostream & out,
    const Error & error ) [friend]
```

Add friendly output.

Parameters

<i>out</i>	The output stream.
<i>error</i>	The Error object.

Returns

The output stream.

The documentation for this class was generated from the following files:

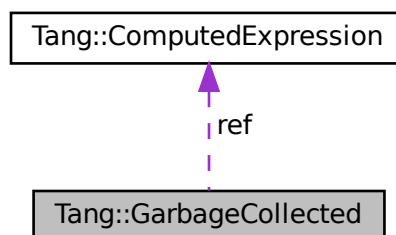
- [include/error.hpp](#)
- [src/error.cpp](#)

5.49 Tang::GarbageCollected Class Reference

A container that acts as a resource-counting garbage collector for the specified type.

```
#include <garbageCollected.hpp>
```

Collaboration diagram for Tang::GarbageCollected:



Public Member Functions

- `GarbageCollected (const GarbageCollected &other)`
`Copy Constructor.`
- `GarbageCollected (GarbageCollected &&other)`
`Move Constructor.`
- `GarbageCollected & operator= (const GarbageCollected &other)`
`Copy Assignment.`
- `GarbageCollected & operator= (GarbageCollected &&other)`
`Move Assignment.`
- `~GarbageCollected ()`
`Destructor.`
- `bool isCopyNeeded () const`
`Determine whether or not a copy is needed as determined by the referenced ComputedExpression.`
- `GarbageCollected makeCopy () const`
`Create a separate copy of the original GarbageCollected value.`
- `ComputedExpression * operator-> () const`
`Access the tracked object as a pointer.`
- `ComputedExpression & operator* () const`
`Access the tracked object.`
- `bool operator== (const Tang::integer_t &val) const`
`Compare the GarbageCollected tracked object with a supplied value.`
- `bool operator== (const Tang::float_t &val) const`
`Compare the GarbageCollected tracked object with a supplied value.`
- `bool operator== (const bool &val) const`
`Compare the GarbageCollected tracked object with a supplied value.`
- `bool operator== (const std::string &val) const`
`Compare the GarbageCollected tracked object with a supplied value.`
- `bool operator== (const char *const &val) const`
`Compare the GarbageCollected tracked object with a supplied value.`
- `bool operator== (const Error &val) const`
`Compare the GarbageCollected tracked object with a supplied value.`
- `bool operator== (const std::nullptr_t &null) const`
`Compare the GarbageCollected tracked object with a supplied value.`
- `GarbageCollected operator+ (const GarbageCollected &rhs) const`
`Perform an addition between two GarbageCollected values.`
- `GarbageCollected operator- (const GarbageCollected &rhs) const`
`Perform a subtraction between two GarbageCollected values.`
- `GarbageCollected operator* (const GarbageCollected &rhs) const`
`Perform a multiplication between two GarbageCollected values.`
- `GarbageCollected operator/ (const GarbageCollected &rhs) const`
`Perform a division between two GarbageCollected values.`
- `GarbageCollected operator% (const GarbageCollected &rhs) const`
`Perform a modulo between two GarbageCollected values.`
- `GarbageCollected operator- () const`
`Perform a negation on the GarbageCollected value.`
- `GarbageCollected operator! () const`
`Perform a logical not on the GarbageCollected value.`
- `GarbageCollected operator< (const GarbageCollected &rhs) const`
`Perform a < between two GarbageCollected values.`
- `GarbageCollected operator<= (const GarbageCollected &rhs) const`

- `operator<=` (const `GarbageCollected` &rhs) const
Perform a <= between two `GarbageCollected` values.
- `operator>` (const `GarbageCollected` &rhs) const
Perform a > between two `GarbageCollected` values.
- `operator>=` (const `GarbageCollected` &rhs) const
Perform a >= between two `GarbageCollected` values.
- `operator==` (const `GarbageCollected` &rhs) const
Perform a == between two `GarbageCollected` values.
- `operator!=` (const `GarbageCollected` &rhs) const
Perform a != between two `GarbageCollected` values.

Static Public Member Functions

- `template<class T , typename... Args> static GarbageCollected make (Args... args)`
Creates a garbage-collected object of the specified type.

Protected Member Functions

- `operator()`
Constructs a garbage-collected object of the specified type.

Protected Attributes

- `size_t * count`
The count of references to the tracked object.
- `ComputedExpression * ref`
A reference to the tracked object.
- `std::function< void(void)> recycle`
A cleanup function to recycle the object.

Friends

- `std::ostream & operator<< (std::ostream &out, const GarbageCollected &gc)`
Add friendly output.

5.49.1 Detailed Description

A container that acts as a resource-counting garbage collector for the specified type.

Uses the `SingletonObjectPool` to created and recycle object memory. The container is not thread-safe.

5.49.2 Constructor & Destructor Documentation

5.49.2.1 GarbageCollected() [1/3]

```
GarbageCollected::GarbageCollected (
    const GarbageCollected & other )
```

Copy Constructor.

Parameters

<i>The</i>	other GarbageCollected object to copy.
------------	--

5.49.2.2 GarbageCollected() [2/3]

```
GarbageCollected::GarbageCollected (
    GarbageCollected && other )
```

Move Constructor.

Parameters

<i>The</i>	other GarbageCollected object to move.
------------	--

5.49.2.3 ~GarbageCollected()

```
GarbageCollected::~GarbageCollected ( )
```

Destructor.

Clean up the tracked object, if appropriate.

5.49.2.4 GarbageCollected() [3/3]

```
Tang::GarbageCollected::GarbageCollected ( ) [inline], [protected]
```

Constructs a garbage-collected object of the specified type.

It is private so that a [GarbageCollected](#) object can only be created using the [GarbageCollected::make\(\)](#) function.

Parameters

<i>variable</i>	The arguments to pass to the constructor of the specified type.
-----------------	---

5.49.3 Member Function Documentation**5.49.3.1 isCopyNeeded()**

```
bool GarbageCollected::isCopyNeeded ( ) const
```

Determine whether or not a copy is needed as determined by the referenced [ComputedExpression](#).

Returns

Whether or not a copy is needed.

5.49.3.2 make()

```
template<class T , typename... Args>
static GarbageCollected Tang::GarbageCollected::make (
    Args... args ) [inline], [static]
```

Creates a garbage-collected object of the specified type.

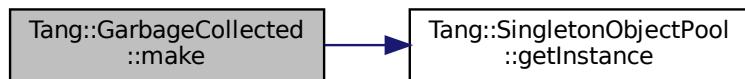
Parameters

<i>variable</i>	The arguments to pass to the constructor of the specified type.
-----------------	---

Returns

A [GarbageCollected](#) object.

Here is the call graph for this function:



5.49.3.3 makeCopy()

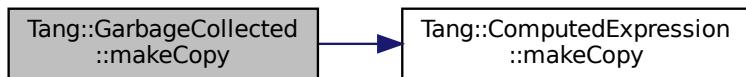
```
GarbageCollected GarbageCollected::makeCopy () const
```

Create a separate copy of the original [GarbageCollected](#) value.

Returns

A [GarbageCollected](#) copy of the original value.

Here is the call graph for this function:

**5.49.3.4 operator"!"()**

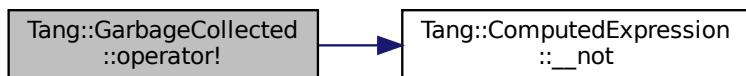
```
GarbageCollected GarbageCollected::operator! ( ) const
```

Perform a logical not on the [GarbageCollected](#) value.

Returns

The result of the operation.

Here is the call graph for this function:

**5.49.3.5 operator"!=()**

```
GarbageCollected GarbageCollected::operator!= (
    const GarbageCollected & rhs ) const
```

Perform a != between two [GarbageCollected](#) values.

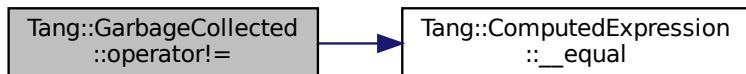
Parameters

<i>rhs</i>	The right hand side operand.
------------	------------------------------

Returns

The result of the operation.

Here is the call graph for this function:



5.49.3.6 operator%()

```
GarbageCollected GarbageCollected::operator% (
    const GarbageCollected & rhs ) const
```

Perform a modulo between two `GarbageCollected` values.

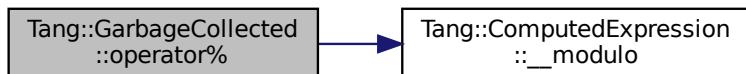
Parameters

<i>rhs</i>	The right hand side operand.
------------	------------------------------

Returns

The result of the operation.

Here is the call graph for this function:



5.49.3.7 operator*() [1/2]

```
ComputedExpression & GarbageCollected::operator* ( ) const
```

Access the tracked object.

Returns

A reference to the tracked object.

5.49.3.8 operator*() [2/2]

```
GarbageCollected GarbageCollected::operator* (
    const GarbageCollected & rhs ) const
```

Perform a multiplication between two **GarbageCollected** values.

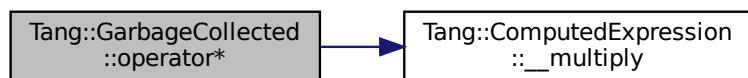
Parameters

<i>rhs</i>	The right hand side operand.
------------	------------------------------

Returns

The result of the operation.

Here is the call graph for this function:



5.49.3.9 operator+()

```
GarbageCollected GarbageCollected::operator+ (
    const GarbageCollected & rhs ) const
```

Perform an addition between two **GarbageCollected** values.

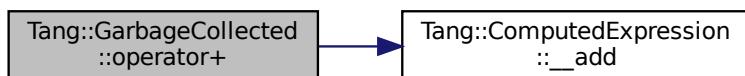
Parameters

<i>rhs</i>	The right hand side operand.
------------	------------------------------

Returns

The result of the operation.

Here is the call graph for this function:

**5.49.3.10 operator-() [1/2]**

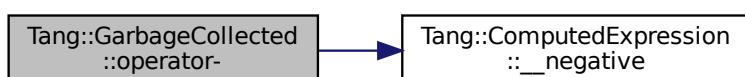
`GarbageCollected GarbageCollected::operator- () const`

Perform a negation on the `GarbageCollected` value.

Returns

The result of the operation.

Here is the call graph for this function:

**5.49.3.11 operator-() [2/2]**

`GarbageCollected GarbageCollected::operator- (const GarbageCollected & rhs) const`

Perform a subtraction between two `GarbageCollected` values.

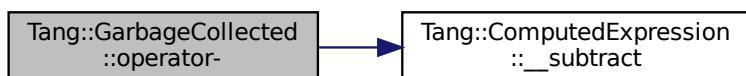
Parameters

<i>rhs</i>	The right hand side operand.
------------	------------------------------

Returns

The result of the operation.

Here is the call graph for this function:



5.49.3.12 operator->()

```
ComputedExpression * GarbageCollected::operator-> ( ) const
```

Access the tracked object as a pointer.

Returns

A pointer to the tracked object.

5.49.3.13 operator/()

```
GarbageCollected GarbageCollected::operator/ (
    const GarbageCollected & rhs ) const
```

Perform a division between two `GarbageCollected` values.

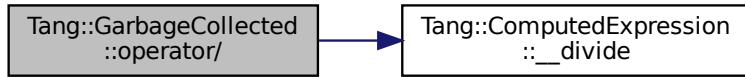
Parameters

<i>rhs</i>	The right hand side operand.
------------	------------------------------

Returns

The result of the operation.

Here is the call graph for this function:



5.49.3.14 operator<()

```
GarbageCollected GarbageCollected::operator< (
    const GarbageCollected & rhs ) const
```

Perform a $<$ between two [GarbageCollected](#) values.

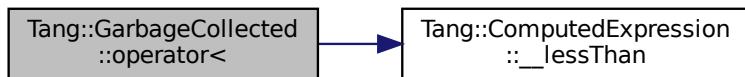
Parameters

<i>rhs</i>	The right hand side operand.
------------	------------------------------

Returns

The result of the operation.

Here is the call graph for this function:



5.49.3.15 operator<=()

```
GarbageCollected GarbageCollected::operator<= (
    const GarbageCollected & rhs ) const
```

Perform a \leq between two [GarbageCollected](#) values.

Parameters

<i>rhs</i>	The right hand side operand.
------------	------------------------------

Returns

The result of the operation.

5.49.3.16 operator=() [1/2]

```
GarbageCollected & GarbageCollected::operator= (
    const GarbageCollected & other )
```

Copy Assignment.

Parameters

<i>The</i>	other GarbageCollected object.
------------	--------------------------------

5.49.3.17 operator=() [2/2]

```
GarbageCollected & GarbageCollected::operator= (
    GarbageCollected && other )
```

Move Assignment.

Parameters

<i>The</i>	other GarbageCollected object.
------------	--------------------------------

5.49.3.18 operator==() [1/8]

```
bool GarbageCollected::operator== (
    const bool & val ) const
```

Compare the [GarbageCollected](#) tracked object with a supplied value.

Parameters

<i>val</i>	The value to compare the tracked object against.
------------	--

Returns

True if they are equal, false otherwise.

5.49.3.19 operator==() [2/8]

```
bool GarbageCollected::operator== (
    const char *const & val ) const
```

Compare the [GarbageCollected](#) tracked object with a supplied value.

Parameters

<code>val</code>	The value to compare the tracked object against.
------------------	--

Returns

True if they are equal, false otherwise.

5.49.3.20 operator==() [3/8]

```
bool GarbageCollected::operator== (
    const Error & val ) const
```

Compare the [GarbageCollected](#) tracked object with a supplied value.

Parameters

<code>val</code>	The value to compare the tracked object against.
------------------	--

Returns

True if they are equal, false otherwise.

5.49.3.21 operator==() [4/8]

```
GarbageCollected GarbageCollected::operator== (
    const GarbageCollected & rhs ) const
```

Perform a == between two [GarbageCollected](#) values.

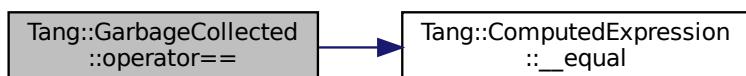
Parameters

<i>rhs</i>	The right hand side operand.
------------	------------------------------

Returns

The result of the operation.

Here is the call graph for this function:

**5.49.3.22 operator==() [5/8]**

```
bool GarbageCollected::operator== (
    const std::nullptr_t & null) const
```

Compare the [GarbageCollected](#) tracked object with a supplied value.

Parameters

<i>val</i>	The value to compare the tracked object against.
------------	--

Returns

True if they are equal, false otherwise.

5.49.3.23 operator==() [6/8]

```
bool GarbageCollected::operator== (
    const std::string & val) const
```

Compare the [GarbageCollected](#) tracked object with a supplied value.

Parameters

<i>val</i>	The value to compare the tracked object against.
------------	--

Returns

True if they are equal, false otherwise.

5.49.3.24 operator==() [7/8]

```
bool GarbageCollected::operator== (
    const Tang::float_t & val ) const
```

Compare the [GarbageCollected](#) tracked object with a supplied value.

Parameters

<code>val</code>	The value to compare the tracked object against.
------------------	--

Returns

True if they are equal, false otherwise.

5.49.3.25 operator==() [8/8]

```
bool GarbageCollected::operator== (
    const Tang::integer_t & val ) const
```

Compare the [GarbageCollected](#) tracked object with a supplied value.

Parameters

<code>val</code>	The value to compare the tracked object against.
------------------	--

Returns

True if they are equal, false otherwise.

Here is the call graph for this function:



5.49.3.26 operator>()

```
GarbageCollected GarbageCollected::operator> (
    const GarbageCollected & rhs ) const
```

Perform a `>` between two `GarbageCollected` values.

Parameters

<code>rhs</code>	The right hand side operand.
------------------	------------------------------

Returns

The result of the operation.

5.49.3.27 operator>=()

```
GarbageCollected GarbageCollected::operator>= (
    const GarbageCollected & rhs ) const
```

Perform a `>=` between two `GarbageCollected` values.

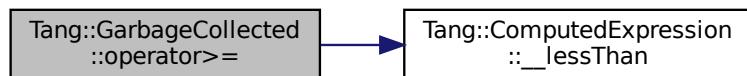
Parameters

<code>rhs</code>	The right hand side operand.
------------------	------------------------------

Returns

The result of the operation.

Here is the call graph for this function:



5.49.4 Friends And Related Function Documentation

5.49.4.1 operator<<

```
std::ostream& operator<< (  
    std::ostream & out,  
    const GarbageCollected & gc ) [friend]
```

Add friendly output.

Parameters

<i>out</i>	The output stream.
<i>gc</i>	The GarbageCollected value.

Returns

The output stream.

The documentation for this class was generated from the following files:

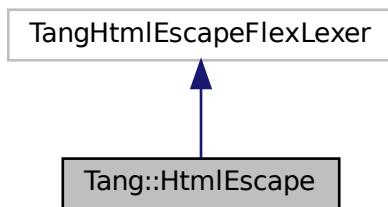
- [include/garbageCollected.hpp](#)
- [src/garbageCollected.cpp](#)

5.50 Tang::HtmlEscape Class Reference

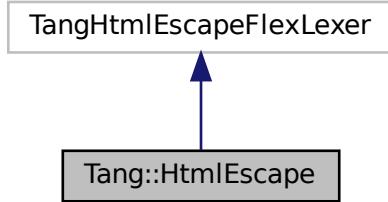
The Flex lexer class for the main Tang language.

```
#include <htmlEscape.hpp>
```

Inheritance diagram for Tang::HtmlEscape:



Collaboration diagram for Tang::HtmlEscape:



Public Member Functions

- [HtmlEscape](#) (std::istream &arg_yyin, std::ostream &arg_yyout)
The constructor for the Scanner.
- virtual std::string [get_next_token](#) ()
Extract the next token from the input string.

5.50.1 Detailed Description

The Flex lexer class for the main Tang language.

Flex requires that our lexer class inherit from yyFlexLexer, an "intermediate" class whose real name is "TangTangFlexLexer". We are subclassing it so that we can override the return type of [get_next_token\(\)](#), for compatibility with Bison 3 tokens.

5.50.2 Constructor & Destructor Documentation

5.50.2.1 HtmlEscape()

```
Tang::HtmlEscape::HtmlEscape (
    std::istream & arg_yyin,
    std::ostream & arg_yyout ) [inline]
```

The constructor for the Scanner.

The design of the Flex lexer is to tokenize the contents of an input stream, and to write any error messages to an output stream. In our implementation, however, errors are returned differently, so the output stream is never used. Its presence is retained, however, in case it is needed in the future.

For now, the general approach should be to supply the input as a string stream, and to use std::cout as the output.

Parameters

<i>arg_yyin</i>	The input stream to be tokenized
<i>arg_yyout</i>	The output stream (not currently used)

5.50.3 Member Function Documentation

5.50.3.1 get_next_token()

```
virtual std::string Tang::HtmlEscape::get_next_token ( ) [virtual]
```

Extract the next token from the input string.

Returns

The next unescaped character.

The documentation for this class was generated from the following file:

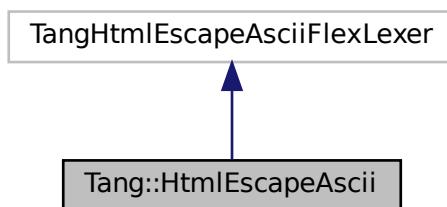
- [include/htmlEscape.hpp](#)

5.51 Tang::HtmlEscapeAscii Class Reference

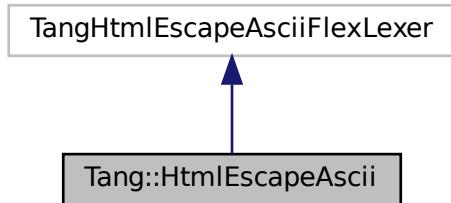
The Flex lexer class for the main Tang language.

```
#include <htmlEscapeAscii.hpp>
```

Inheritance diagram for Tang::HtmlEscapeAscii:



Collaboration diagram for Tang::HtmlEscapeAscii:



Public Member Functions

- [HtmlEscapeAscii \(std::istream &arg_yyin, std::ostream &arg_yyout, UnicodeString::Type type\)](#)
The constructor for the Scanner.
- virtual std::string [get_next_token \(\)](#)
Extract the next token from the input string.

Private Attributes

- [UnicodeString::Type type](#)
The type of string that is being escaped.

5.51.1 Detailed Description

The Flex lexer class for the main Tang language.

Flex requires that our lexer class inherit from yyFlexLexer, an "intermediate" class whose real name is "TangTangFlexLexer". We are subclassing it so that we can override the return type of [get_next_token\(\)](#), for compatibility with Bison 3 tokens.

5.51.2 Constructor & Destructor Documentation

5.51.2.1 HtmlEscapeAscii()

```
Tang::HtmlEscapeAscii::HtmlEscapeAscii (
    std::istream & arg_yyin,
    std::ostream & arg_yyout,
    UnicodeString::Type type ) [inline]
```

The constructor for the Scanner.

The design of the Flex lexer is to tokenize the contents of an input stream, and to write any error messages to an output stream. In our implementation, however, errors are returned differently, so the output stream is never used. Its presence is retained, however, in case it is needed in the future.

For now, the general approach should be to supply the input as a string stream, and to use std::cout as the output.

Parameters

<i>arg_yyin</i>	The input stream to be tokenized
<i>arg_yyout</i>	The output stream (not currently used)

5.51.3 Member Function Documentation**5.51.3.1 get_next_token()**

```
virtual std::string Tang::HtmlEscapeAscii::get_next_token ( ) [virtual]
```

Extract the next token from the input string.

Returns

The next unescaped character.

The documentation for this class was generated from the following file:

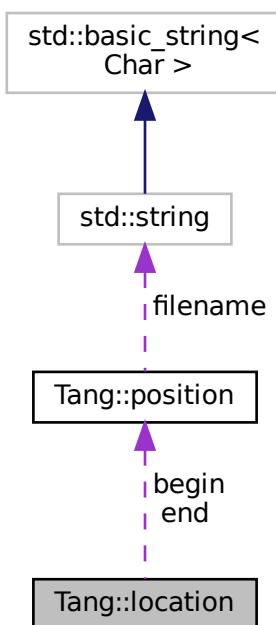
- [include/htmlEscapeAscii.hpp](#)

5.52 Tang::location Class Reference

Two points in a source file.

```
#include <location.hh>
```

Collaboration diagram for Tang::location:



Public Types

- `typedef position::filename_type filename_type`
Type for file name.
- `typedef position::counter_type counter_type`
Type for line and column numbers.

Public Member Functions

- `location (const position &b, const position &e)`
Construct a location from b to e.
- `location (const position &p=position())`
Construct a 0-width location in p.
- `location (filename_type *f, counter_type l=1, counter_type c=1)`
Construct a 0-width location in f, l, c.
- `void initialize (filename_type *f=((void *) 0), counter_type l=1, counter_type c=1)`
Initialization.

Line and Column related manipulators

- `void step ()`
Reset initial location to final location.
- `void columns (counter_type count=1)`
Extend the current location to the COUNT next columns.
- `void lines (counter_type count=1)`
Extend the current location to the COUNT next lines.

Public Attributes

- `position begin`
Beginning of the located region.
- `position end`
End of the located region.

5.52.1 Detailed Description

Two points in a source file.

The documentation for this class was generated from the following file:

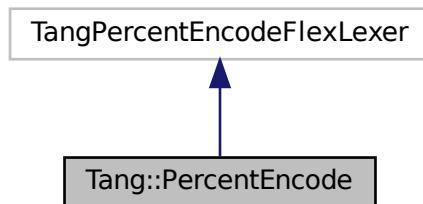
- build/generated/location.hh

5.53 Tang::PercentEncode Class Reference

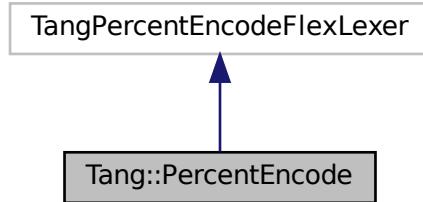
The Flex lexer class for the Percent Encode scanner.

```
#include <percentEncode.hpp>
```

Inheritance diagram for Tang::PercentEncode:



Collaboration diagram for Tang::PercentEncode:



Public Member Functions

- [PercentEncode](#) (std::istream &arg_yyin, std::ostream &arg_yyout)
The constructor for the Scanner.
- virtual std::string [get_next_token](#) ()
Extract the next token from the input string.

5.53.1 Detailed Description

The Flex lexer class for the Percent Encode scanner.

Flex requires that our lexer class inherit from yyFlexLexer, an "intermediate" class whose real name is "TangPercentEncodeFlexLexer". We are subclassing it so that we can override the return type of [get_next_token\(\)](#), for compatibility with Bison 3 tokens.

5.53.2 Constructor & Destructor Documentation

5.53.2.1 PercentEncode()

```
Tang::PercentEncode::PercentEncode (
    std::istream & arg_yyin,
    std::ostream & arg_yyout ) [inline]
```

The constructor for the Scanner.

The design of the Flex lexer is to tokenize the contents of an input stream, and to write any error messages to an output stream. In our implementation, however, errors are returned differently, so the output stream is never used. Its presence is retained, however, in case it is needed in the future.

For now, the general approach should be to supply the input as a string stream, and to use `std::cout` as the output.

Parameters

<code>arg_yyin</code>	The input stream to be tokenized
<code>arg_yyout</code>	The output stream (not currently used)

5.53.3 Member Function Documentation

5.53.3.1 get_next_token()

```
virtual std::string Tang::PercentEncode::get_next_token ( ) [virtual]
```

Extract the next token from the input string.

Returns

The next unescaped character.

The documentation for this class was generated from the following file:

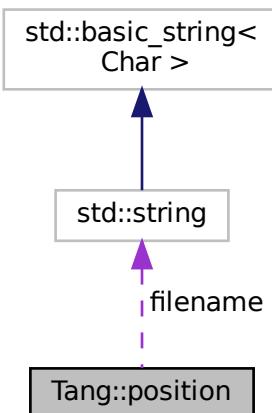
- [include/percentEncode.hpp](#)

5.54 Tang::position Class Reference

A point in a source file.

```
#include <location.hh>
```

Collaboration diagram for Tang::position:



Public Types

- `typedef const std::string filename_type`
Type for file name.
- `typedef int counter_type`
Type for line and column numbers.

Public Member Functions

- `position (filename_type *f=((void *) 0), counter_type l=1, counter_type c=1)`
Construct a position.
- `void initialize (filename_type *fn=((void *) 0), counter_type l=1, counter_type c=1)`
Initialization.

Line and Column related manipulators

- `void lines (counter_type count=1)`
(line related) Advance to the COUNT next lines.
- `void columns (counter_type count=1)`
(column related) Advance to the COUNT next columns.

Public Attributes

- `filename_type * filename`
File name to which this position refers.
- `counter_type line`
Current line number.
- `counter_type column`
Current column number.

Static Private Member Functions

- static `counter_type add_ (counter_type lhs, counter_type rhs, counter_type min)`
Compute max (min, lhs+rhs).

5.54.1 Detailed Description

A point in a source file.

The documentation for this class was generated from the following file:

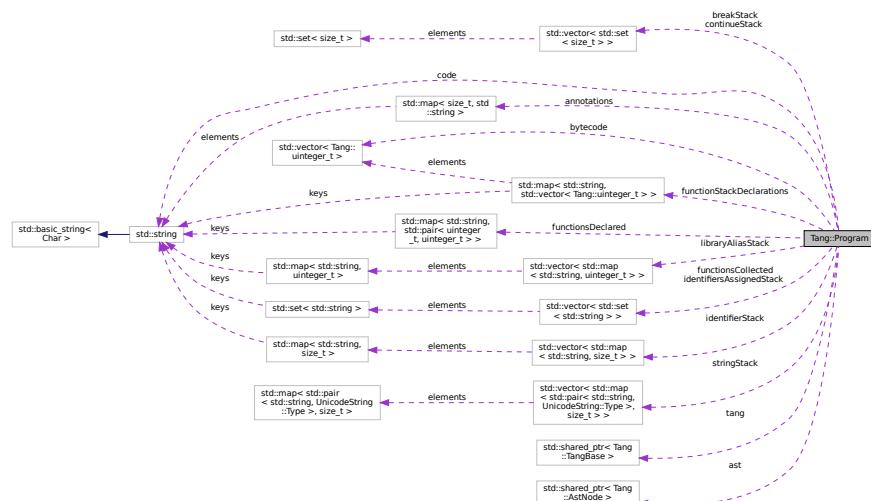
- build/generated/location.hh

5.55 Tang::Program Class Reference

Represents a compiled script or template that may be executed.

```
#include <program.hpp>
```

Collaboration diagram for Tang::Program:



Public Types

- enum `CodeType` { `Script` , `Template` }
- Indicate the type of code that was supplied to the `Program`.*

Public Member Functions

- `Program` (const std::string &`code`, `CodeType codeType`, std::shared_ptr< `Tang::TangBase` > `tang`)
Create a compiled program using the provided code.
- `Program` (std::istream &`code`, `CodeType codeType`, std::shared_ptr< `Tang::TangBase` > `tang`)
Create a compiled program using the provided code.
- `std::string getCode () const`
Get the code that was provided when the `Program` was created.
- `std::optional< const std::shared_ptr< AstNode > > getAst () const`
Get the AST that was generated by the parser.
- `std::string dumpBytecode () const`
Get the OpCodes of the compiled program, formatted like Assembly.
- `std::optional< const GarbageCollected > getResult () const`
Get the result of the `Program` execution, if it exists.
- `size_t addBytecode (Tang::uinteger_t)`
Add a `Tang::uinteger_t` to the Bytecode.
- `const Bytecode & getBytecode ()`
Get the Bytecode vector.
- `Context execute ()`
Execute the program's Bytecode, and return the execution `Context`.
- `Context execute (ContextData &&data)`
Execute the program's Bytecode, and return the execution `Context`.
- `bool setJumpTarget (size_t opcodeAddress, Tang::uinteger_t jumpTarget)`
Set the target address of a Jump opcode.
- `bool setFunctionStackDeclaration (size_t opcodeAddress, uinteger_t argc, uinteger_t targetPC)`
Set the stack details of a function declaration.
- `void pushEnvironment (const std::shared_ptr< AstNode > &ast)`
Create a new compile/execute environment stack entry.
- `void popEnvironment ()`
Remove a compile/execute environment stack entry.
- `void addIdentifier (const std::string &name, std::optional< size_t > position={})`
Add an identifier to the environment.
- `const std::map< std::string, size_t > & getIdentifiers () const`
Get the identifier map of the current environment.
- `void addLibraryAlias (const std::string &name)`
Add a library alias to the environment.
- `const std::map< std::string, uinteger_t > & getLibraryAliases () const`
Get the library alias map of the current environment.
- `void addIdentifierAssigned (const std::string &name)`
Indicate that an identifier will be altered within the associated scope.
- `const std::set< std::string > & getIdentifiersAssigned () const`
Get the set of identifiers that will be assigned in the current scope.
- `void addString (const std::string &name, UnicodeString::Type)`
Add a string to the environment.
- `const std::map< std::pair< std::string, UnicodeString::Type >, size_t > & getStrings () const`

- **Get the string map of the current environment.**
- void **pushBreakStack ()**
Increase the break environment stack, so that we can handle nested break-supporting structures.
- void **addBreak (size_t location)**
Add the Bytecode location of a break statement, to be set when the final target is known at a later time.
- void **popBreakStack (size_t target)**
For all continue bytecode locations collected by Tang::addContinue, set the target pc to target.
- void **pushContinueStack ()**
Increase the continue environment stack, so that we can handle nested continue-supporting structures.
- void **addContinue (size_t location)**
Add the Bytecode location of a continue statement, to be set when the final target is known at a later time.
- void **popContinueStack (size_t target)**
For all continue bytecode locations collected by Tang::addContinue, set the target pc to target.
- void **setAnnotation (size_t offset, const std::string &annotation)**
Set a bytecode annotation.
- const **OpcodeAnnotations & getAnnotations () const**
Get the bytecode annotations.

Public Attributes

- std::vector< std::set< std::string > > **functionsCollected**
Names of the functions that are declared in a previous or the current scope.
- std::map< std::string, std::pair< uinteger_t, uinteger_t > > **functionsDeclared**
Key/value pair of the function declaration information.
- std::map< std::string, std::vector< Tang::uinteger_t > > **functionStackDeclarations**
For each function name, a list of Bytecode addresses that need to be replaced by a function definition.

Private Member Functions

- void **parse ()**
Parse the code into an AST.
- void **compile ()**
Compile the AST into Bytecode.
- std::pair< **OpcodeOffsets**, **OpcodePositions** > **analyze () const**
Analyze the current Bytecode.
- void **optimize ()**
Optimize the Bytecode.

Private Attributes

- std::shared_ptr< Tang::TangBase > **tang**
A pointer to the base Tang class.
- std::vector< std::map< std::string, size_t > > **identifierStack**
Stack of mappings of identifiers to their stack locations.
- std::vector< std::map< std::string, uinteger_t > > **libraryAliasStack**
Stack of library aliases that are used in the program.
- std::vector< std::set< std::string > > **identifiersAssignedStack**
Stack of sets of identifiers that are the target of an assignment statement within the associated scope.
- std::vector< std::map< std::pair< std::string, UnicodeString::Type >, size_t > > **stringStack**

- *Stack of mappings of strings to their stack locations.*
 - std::vector< std::set< size_t > > **breakStack**
Stack of a collection of break statement locations.
 - std::vector< std::set< size_t > > **continueStack**
Stack of a collection of continue statement locations.
 - std::string **code**
The code supplied when the [Program](#) was instantiated.
 - std::optional< std::istream * > **istreamCode**
An optional istream which supplied the code.
 - **CodeType codeType**
The type of code that was supplied when the [Program](#) was instantiated.
 - std::shared_ptr< [AstNode](#) > **ast**
A pointer to the AST, if parsing was successful.
 - **Bytecode bytecode**
The Bytecode of the compiled program.
 - std::optional< [GarbageCollected](#) > **result**
The result of the [Program](#) compilation.
 - **OpcodeAnnotations annotations**
Bytecode annotations.

5.55.1 Detailed Description

Represents a compiled script or template that may be executed.

5.55.2 Member Enumeration Documentation

5.55.2.1 CodeType

```
enum Tang::Program::CodeType
```

Indicate the type of code that was supplied to the [Program](#).

Enumerator

Script	The code is pure Tang script, without any templating.
Template	The code is a template.

5.55.3 Constructor & Destructor Documentation

5.55.3.1 Program() [1/2]

```
Program::Program (
    const std::string & code,
    Program::CodeType codeType,
    std::shared_ptr< Tang::TangBase > tang )
```

Create a compiled program using the provided code.

Parameters

<i>code</i>	The code to be compiled.
<i>codeType</i>	Whether the code is a Script or Template.
<i>tang</i>	A pointer to the base Tang class.

5.55.3.2 Program() [2/2]

```
Program::Program (
    std::istream & code,
    Program::CodeType codeType,
    std::shared_ptr< Tang::TangBase > tang )
```

Create a compiled program using the provided code.

Parameters

<i>code</i>	An istream to the code to be compiled.
<i>codeType</i>	Whether the code is a Script or Template.
<i>tang</i>	A pointer to the base Tang class.

5.55.4 Member Function Documentation

5.55.4.1 addBreak()

```
void Program::addBreak (
    size_t location )
```

Add the Bytecode location of a `break` statement, to be set when the final target is known at a later time.

Parameters

<i>location</i>	The offset location of the <code>break</code> bytecode.
-----------------	---

5.55.4.2 addBytecode()

```
size_t Program::addBytecode (
    Tang::uinteger_t op )
```

Add a Tang::uinteger_t to the Bytecode.

Parameters

<i>op</i>	The value to add to the Bytecode.
-----------	-----------------------------------

Returns

The size of the bytecode structure.

5.55.4.3 addContinue()

```
void Program::addContinue (
    size_t location )
```

Add the Bytecode location of a `continue` statement, to be set when the final target is known at a later time.

Parameters

<i>location</i>	The offset location of the <code>continue</code> bytecode.
-----------------	--

5.55.4.4 addIdentifier()

```
void Program::addIdentifier (
    const std::string & name,
    std::optional< size_t > position = {} )
```

Add an identifier to the environment.

Parameters

<i>name</i>	The variable to add to the environment.
<i>position</i>	If provided, the desired position to place the identifier.

5.55.4.5 addIdentifierAssigned()

```
void Program::addIdentifierAssigned (
    const std::string & name )
```

Indicate that an identifier will be altered within the associated scope.

Parameters

<i>name</i>	The identifier name.
-------------	----------------------

5.55.4.6 addLibraryAlias()

```
void Program::addLibraryAlias (
    const std::string & name )
```

Add a library alias to the environment.

Parameters

<i>name</i>	The library alias to add to the environment.
-------------	--

5.55.4.7 addString()

```
void Program::addString (
    const std::string & name,
    UnicodeString::Type type )
```

Add a string to the environment.

Parameters

<i>name</i>	The variable to add to the environment.
<i>type</i>	The UnicodeString::Type of the string.

5.55.4.8 dumpBytecode()

```
string Program::dumpBytecode ( ) const
```

Get the OpCodes of the compiled program, formatted like Assembly.

Returns

A string containing the Opcode representation.

5.55.4.9 execute() [1/2]

```
Context Program::execute ( )
```

Execute the program's Bytecode, and return the execution [Context](#).

A default ContextData will be generated for the execution.

Returns

The execution [Context](#).

5.55.4.10 execute() [2/2]

```
Context Program::execute ( ContextData && data )
```

Execute the program's Bytecode, and return the execution [Context](#).

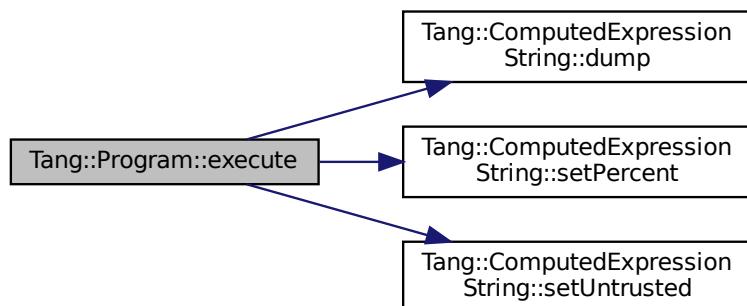
Parameters

<i>data</i>	The default data to be made available to the execution Context .
-------------	--

Returns

The execution [Context](#).

Here is the call graph for this function:



5.55.4.11 `getAnnotations()`

```
const map< size_t, string > & Program::getAnnotations ( ) const
```

Get the bytecode annotations.

Returns

A map of bytecode offsets to their associated annotation.

5.55.4.12 `getAst()`

```
optional< const shared_ptr< AstNode > > Program::getAst ( ) const
```

Get the AST that was generated by the parser.

The parser may have failed, so the return is an `optional<>` type. If the compilation failed, check `Program::error`.

Returns

A pointer to the AST, if it exists.

5.55.4.13 `getBytecode()`

```
const Bytecode & Program::getBytecode ( )
```

Get the Bytecode vector.

Returns

The Bytecode vector.

5.55.4.14 `getCode()`

```
string Program::getCode ( ) const
```

Get the code that was provided when the `Program` was created.

Returns

The source code from which the `Program` was created.

5.55.4.15 `getIdentifiers()`

```
const map< string, size_t > & Program::getIdentifiers ( ) const
```

Get the identifier map of the current environment.

Returns

A map of each identifier name to its stack position within the current environment.

5.55.4.16 `getIdentifiersAssigned()`

```
const set< string > & Program::getIdentifiersAssigned ( ) const
```

Get the set of identifiers that will be assigned in the current scope.

Returns

A set of identifier names that have been identified as the target of an assignment operator within the current scope.

5.55.4.17 `getLibraryAliases()`

```
const map< string, uinteger_t > & Program::getLibraryAliases ( ) const
```

Get the library alias map of the current environment.

Returns

A map of each library alias to its stack position within the current environment.

5.55.4.18 `getResult()`

```
optional< const GarbageCollected > Program::getResult ( ) const
```

Get the result of the [Program](#) execution, if it exists.

Returns

The result of the [Program](#) execution, if it exists.

5.55.4.19 `getStrings()`

```
const map< pair< string, UnicodeString::Type >, size_t > & Program::getStrings ( ) const
```

Get the string map of the current environment.

Returns

A map of each identifier name to its stack position within the current environment.

5.55.4.20 `popBreakStack()`

```
void Program::popBreakStack (
    size_t target )
```

For all continue bytecode locations collected by Tang::addContinue, set the target pc to target.

Parameters

<i>target</i>	The target bytecode offset that the continue should jump to.
---------------	--

Here is the call graph for this function:



5.55.4.21 `popContinueStack()`

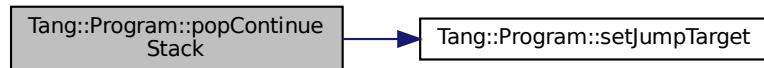
```
void Program::popContinueStack (
    size_t target )
```

For all continue bytecode locations collected by Tang::addContinue, set the target pc to target.

Parameters

<i>target</i>	The target bytecode offset that the continue should jump to.
---------------	--

Here is the call graph for this function:



5.55.4.22 pushEnvironment()

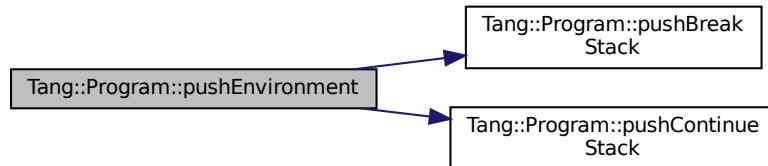
```
void Program::pushEnvironment (
    const std::shared_ptr< AstNode > & ast )
```

Create a new compile/execute environment stack entry.

Parameters

<code>ast</code>	The ast node from which this new environment will be formed.
------------------	--

Here is the call graph for this function:



5.55.4.23 setAnnotation()

```
void Program::setAnnotation (
    size_t offset,
    const std::string & annotation )
```

Set a bytecode annotation.

Parameters

<code>offset</code>	The bytecode offset to associate with the annotation.
<code>annotation</code>	The annotation for the bytecode offset.

Generated by Doxygen

5.55.4.24 setFunctionStackDeclaration()

```
bool Program::setFunctionStackDeclaration (
    size_t opcodeAddress,
    uinteger_t argc,
    uinteger_t targetPC )
```

Set the stack details of a function declaration.

Parameters

<i>opcodeAddress</i>	The location of the FUNCTION opcode.
<i>argc</i>	The argument count to set.
<i>targetPC</i>	The bytecode address of the start of the function.

5.55.4.25 setJumpTarget()

```
bool Program::setJumpTarget (
    size_t opcodeAddress,
    Tang::uinteger_t jumpTarget )
```

Set the target address of a Jump opcode.

Parameters

<i>opcodeAddress</i>	The location of the jump statement.
<i>jumpTarget</i>	The address to jump to.

Returns

Whether or not the jumpTarget was set.

5.55.5 Member Data Documentation

5.55.5.1 functionsDeclared

```
std::map<std::string, std::pair<uinteger_t, uinteger_t> > Tang::Program::functionsDeclared
```

Key/value pair of the function declaration information.

The key is the name of the function. The value is a pair of the `argc` value and the `targetPC` value.

The documentation for this class was generated from the following files:

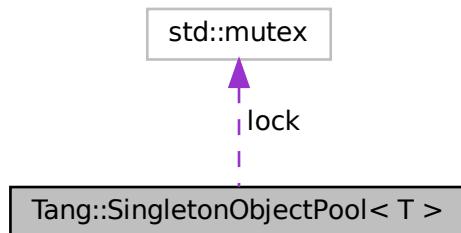
- include/program.hpp
- src/program-analyze.cpp
- src/program-dumpBytecode.cpp
- src/program-execute.cpp
- src/program-optimize.cpp
- src/program.cpp

5.56 Tang::SingletonObjectPool< T > Class Template Reference

A thread-safe, singleton object pool of the designated type.

```
#include <singletonObjectPool.hpp>
```

Collaboration diagram for Tang::SingletonObjectPool< T >:



Public Member Functions

- `T * get ()`
Request an uninitialized memory location from the pool for an object T.
- `void recycle (T *obj)`
Recycle a memory location for an object T.
- `~SingletonObjectPool ()`
Destructor.

Static Public Member Functions

- `static SingletonObjectPool< T > & getInstance ()`
Get the singleton instance of the object pool.

Private Member Functions

- `SingletonObjectPool ()`
The constructor, hidden from being directly called.
- `SingletonObjectPool (const SingletonObjectPool &other)`
The copy constructor, hidden from being called.

Private Attributes

- `T ** allocations`
C-array of allocated blocks, each block contains GROW objects.
- `int currentAllocation`
Index into allocations, representing the current block supplying non-recycled memory addresses.
- `size_t currentIndex`
Current location (within the most recently allocated block) of an available T.*
- `int currentRecycledAllocation`
Index into allocations, representing the current block tracking the recycled memory addresses.
- `int currentRecycledIndex`
Current location (within the currentRecycledAllocation block) of the last available T.*

Static Private Attributes

- `static std::mutex lock`
A mutex for thread-safety.

5.56.1 Detailed Description

```
template<class T>
class Tang::SingletonObjectPool< T >
```

A thread-safe, singleton object pool of the designated type.

5.56.2 Member Function Documentation

5.56.2.1 get()

```
template<class T >
T* Tang::SingletonObjectPool< T >::get ( ) [inline]
```

Request an uninitialized memory location from the pool for an object T.

Returns

An uninitialized memory location for an object T.

5.56.2.2 getInstance()

```
template<class T >
static SingletonObjectPool<T>& Tang::SingletonObjectPool< T >::getInstance ( ) [inline],
[static]
```

Get the singleton instance of the object pool.

Returns

The singleton instance of the object pool.

5.56.2.3 recycle()

```
template<class T >
void Tang::SingletonObjectPool< T >::recycle (
    T * obj ) [inline]
```

Recycle a memory location for an object T.

Parameters

<i>obj</i>	The memory location to recycle.
------------	---------------------------------

5.56.3 Member Data Documentation

5.56.3.1 currentIndex

```
template<class T >
size_t Tang::SingletonObjectPool< T >::currentIndex [private]
```

Current location (within the most recently allocated block) of an available T*.

If currentIndex == GROW, then a new block needs to be allocated.

5.56.3.2 currentRecycledIndex

```
template<class T >
int Tang::SingletonObjectPool< T >::currentRecycledIndex [private]
```

Current location (within the currentRecycledAllocation block) of the last available T*.

If currentRecycledIndex == GROW, then we must move to the next currentRecycledAllocation.

The documentation for this class was generated from the following file:

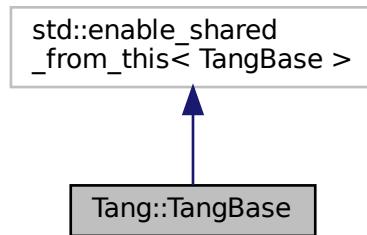
- [include/singletonObjectPool.hpp](#)

5.57 Tang::TangBase Class Reference

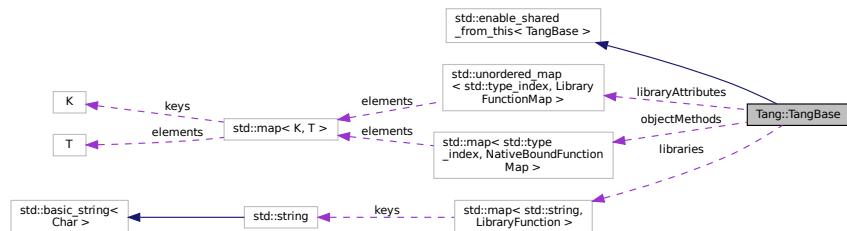
The base class for the Tang programming language.

```
#include <tangBase.hpp>
```

Inheritance diagram for Tang::TangBase:



Collaboration diagram for Tang::TangBase:



Public Member Functions

- **Program compileScript (const std::string &script)**
Compile the provided text as a script and return a Program.
- **Program compileScript (std::istream &script)**
Compile the provided text as a script and return a Program.
- **Program compileTemplate (const std::string &code)**
Compile the provided text as a template and return a Program.
- **Program compileTemplate (std::istream &code)**
Compile the provided text as a template and return a Program.
- **TangBase ()**
The constructor.
- **std::map< std::type_index, NativeBoundFunctionMap > & getObjectMethods ()**
Get the object methods available to this instance of the base language object.
- **LibraryFunctionMap & getLibraries ()**
Get the libraries available to this instance of the base language object.
- **std::unordered_map< std::type_index, LibraryFunctionMap > & getLibraryAttributes ()**
Get the library attributes available to this instance of the base language object.

Static Public Member Functions

- static std::shared_ptr< [TangBase](#) > [make_shared\(\)](#)
Create an instance of Tang and return a reference to it as a shared pointer.

Private Attributes

- std::map< std::type_index, NativeBoundFunctionMap > [objectMethods](#)
Store the available object methods.
- [LibraryFunctionMap](#) [libraries](#)
Store the available libraries.
- std::unordered_map< std::type_index, LibraryFunctionMap > [libraryAttributes](#)
Store the available library attributes.

5.57.1 Detailed Description

The base class for the Tang programming language.

This class is the fundamental starting point to compile and execute a Tang program. It may be considered in three parts:

1. It acts as an extendable interface through which additional "library" functions can be added to the language.
It is intentionally designed that each instance of [TangBase](#) will have its own library functions.
2. It provides methods to compile scripts and templates, resulting in a [Program](#) object.
3. The [Program](#) object may then be executed, providing instance-specific context information (*i.e.*, state).

5.57.2 Constructor & Destructor Documentation

5.57.2.1 [TangBase\(\)](#)

```
TangBase::TangBase ( )
```

The constructor.

This function should never be called directly. Rather, always use the [Tang::TangBase::make_shared\(\)](#) static method, which supplies the shared pointer necessary for creation of [Program](#) objects.

5.57.3 Member Function Documentation

5.57.3.1 [compileScript\(\) \[1/2\]](#)

```
Program TangBase::compileScript (
    const std::string & script )
```

Compile the provided text as a script and return a [Program](#).

Parameters

<i>script</i>	The Tang script to be compiled.
---------------	---------------------------------

Returns

The [Program](#) object representing the compiled script.

5.57.3.2 compileScript() [2/2]

```
Program TangBase::compileScript (
    std::istream & script )
```

Compile the provided text as a script and return a [Program](#).

Parameters

<i>script</i>	An istream to the Tang script to be compiled.
---------------	---

Returns

The [Program](#) object representing the compiled script.

5.57.3.3 compileTemplate() [1/2]

```
Program TangBase::compileTemplate (
    const std::string & code )
```

Compile the provided text as a template and return a [Program](#).

Parameters

<i>code</i>	The Tang template to be compiled.
-------------	-----------------------------------

Returns

The [Program](#) object representing the compiled template.

5.57.3.4 compileTemplate() [2/2]

```
Program TangBase::compileTemplate (
    std::istream & code )
```

Compile the provided text as a template and return a [Program](#).

Parameters

<code>code</code>	An istream to the Tang template to be compiled.
-------------------	---

Returns

The [Program](#) object representing the compiled template.

5.57.3.5 `make_shared()`

```
shared_ptr< TangBase > TangBase::make_shared ( ) [static]
```

Create an instance of Tang and return a reference to it as a shared pointer.

Returns

A shared pointer to the base Tang object.

The documentation for this class was generated from the following files:

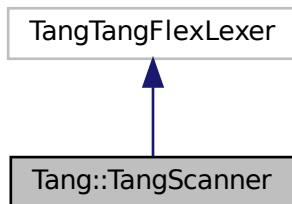
- [include/tangBase.hpp](#)
- [src/tangBase.cpp](#)

5.58 Tang::TangScanner Class Reference

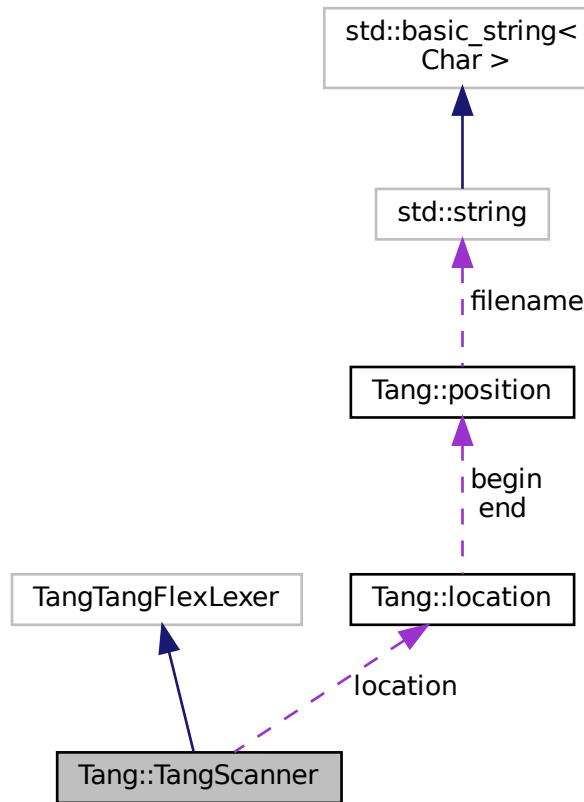
The Flex lexer class for the main Tang language.

```
#include <tangScanner.hpp>
```

Inheritance diagram for Tang::TangScanner:



Collaboration diagram for Tang::TangScanner:



Public Member Functions

- [TangScanner \(std::istream &arg_yyin, std::ostream &arg_yyout\)](#)
The constructor for the Scanner.
- [virtual Tang::TangParser::symbol_type get_next_token \(\)](#)
A pass-through function that we supply so that we can provide a Bison 3 token return type instead of the int that is returned by the default class configuration.
- [void setModeTemplate \(\)](#)
Helper function to set the scanner to template parsing mode.

Private Attributes

- [Tang::location location](#)
The location information of the token that is identified.

5.58.1 Detailed Description

The Flex lexer class for the main Tang language.

Flex requires that our lexer class inherit from yyFlexLexer, an "intermediate" class whose real name is "TangTangFlexLexer". We are subclassing it so that we can override the return type of [get_next_token\(\)](#), for compatibility with Bison 3 tokens.

5.58.2 Constructor & Destructor Documentation

5.58.2.1 TangScanner()

```
Tang::TangScanner::TangScanner (
    std::istream & arg_yyin,
    std::ostream & arg_yyout ) [inline]
```

The constructor for the Scanner.

The design of the Flex lexer is to tokenize the contents of an input stream, and to write any error messages to an output stream. In our implementation, however, errors are returned differently, so the output stream is never used. Its presence is retained, however, in case it is needed in the future.

For now, the general approach should be to supply the input as a string stream, and to use `std::cout` as the output.

Parameters

<code>arg_yyin</code>	The input stream to be tokenized
<code>arg_yyout</code>	The output stream (not currently used)

5.58.3 Member Function Documentation

5.58.3.1 get_next_token()

```
virtual Tang::TangParser::symbol_type Tang::TangScanner::get_next_token ( ) [virtual]
```

A pass-through function that we supply so that we can provide a Bison 3 token return type instead of the `int` that is returned by the default class configuration.

Returns

A Bison 3 token representing the lexeme that was recognized.

The documentation for this class was generated from the following file:

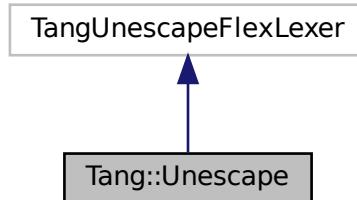
- [include/tangScanner.hpp](#)

5.59 Tang::Unescape Class Reference

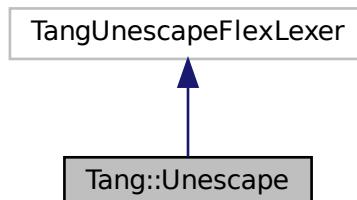
The Flex lexer class for the main Tang language.

```
#include <unescape.hpp>
```

Inheritance diagram for Tang::Unescape:



Collaboration diagram for Tang::Unescape:



Public Member Functions

- [Unescape](#) (std::istream &arg_yyin, std::ostream &arg_yyout)
The constructor for the Scanner.
- virtual std::string [get_next_token](#) ()
Extract the next token from the input string.

5.59.1 Detailed Description

The Flex lexer class for the main Tang language.

Flex requires that our lexer class inherit from yyFlexLexer, an "intermediate" class whose real name is "TangTang←FlexLexer". We are subclassing it so that we can override the return type of [get_next_token\(\)](#), for compatibility with Bison 3 tokens.

5.59.2 Constructor & Destructor Documentation

5.59.2.1 Unescape()

```
Tang::Unescape::Unescape (
    std::istream & arg_yyin,
    std::ostream & arg_yyout ) [inline]
```

The constructor for the Scanner.

The design of the Flex lexer is to tokenize the contents of an input stream, and to write any error messages to an output stream. In our implementation, however, errors are returned differently, so the output stream is never used. Its presence is retained, however, in case it is needed in the future.

For now, the general approach should be to supply the input as a string stream, and to use `std::cout` as the output.

Parameters

<code>arg_yyin</code>	The input stream to be tokenized
<code>arg_yyout</code>	The output stream (not currently used)

5.59.3 Member Function Documentation

5.59.3.1 get_next_token()

```
virtual std::string Tang::Unescape::get_next_token ( ) [virtual]
```

Extract the next token from the input string.

Returns

The next unescaped character.

The documentation for this class was generated from the following file:

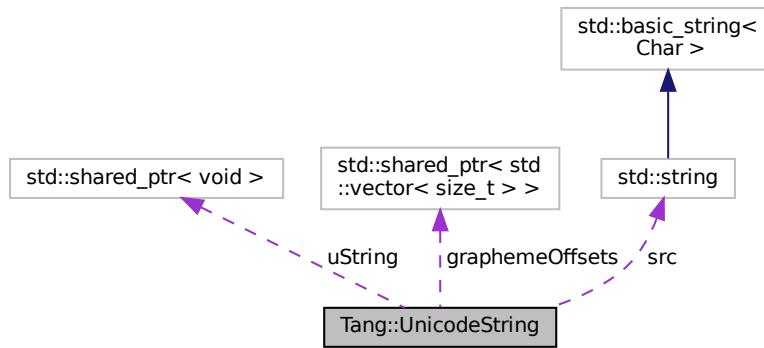
- [include/unescape.hpp](#)

5.60 Tang::UnicodeString Class Reference

Represents a UTF-8 encoded string that is Unicode-aware.

```
#include <unicodeString.hpp>
```

Collaboration diagram for Tang::UnicodeString:



Public Types

- enum [Type](#) { [Trusted](#) , [Untrusted](#) , [Percent](#) }
- The types of string being created.*

Public Member Functions

- [UnicodeString \(\)](#)
Construct an empty [Tang::UnicodeString](#) object, which acts as the interface to the ICU library.
- [UnicodeString \(const UnicodeString &source\)](#)
Construct a [Tang::UnicodeString](#) object, from an existing [Tang::UnicodeString](#).
- [UnicodeString \(const std::string &source\)](#)
Construct a [Tang::UnicodeString](#) object, from an existing std::string.
- [std::string substr \(size_t position, size_t length\) const](#)
Return a Unicode grapheme-aware substring.
- [bool operator== \(const UnicodeString &rhs\) const](#)
Compare two UnicodeStrings.
- [bool operator< \(const UnicodeString &rhs\) const](#)
Compare two UnicodeStrings.
- [UnicodeString operator+ \(const UnicodeString &rhs\) const](#)
Create a new [UnicodeString](#) that is the concatenation of two [UnicodeString](#)s.
- [UnicodeString & operator+= \(const UnicodeString &rhs\)](#)
Concatenate the rhs [UnicodeString](#) to the current [UnicodeString](#).
- [operator std::string \(\) const](#)
Cast the current [UnicodeString](#) object to a std::string, UTF-8 encoded.
- [size_t length \(\) const](#)

- `size_t bytesLength () const`
Return the length of the [UnicodeString](#) in graphemes.
- `std::string render () const`
Return the length of the [UnicodeString](#) in bytes.
- `std::string renderAsHtml () const`
Render the string in with dangerous characters HTML encoded, if the string is [UnicodeString::Type::Untrusted](#).
- `std::string renderAscii () const`
Render the string in with all characters converted to an ASCII representation.
- `void setUntrusted ()`
Set the string as [UnicodeString::Type::Untrusted](#).
- `void setPercent ()`
Set the string as [UnicodeString::Type::Percent](#).

Private Member Functions

- `void generateCachedValues () const`
Calculate cachable values for the object.

Private Attributes

- `std::string src`
The UTF-8 encoded string.
- `UnicodeString::Type type`
The type of string being stored.
- `std::shared_ptr< std::vector< size_t > > graphemeOffsets`
Cache of the grapheme offsets, if they happen to be calculated.
- `std::shared_ptr< void > uString`
Cache of the ICU Unicode string.

5.60.1 Detailed Description

Represents a UTF-8 encoded string that is Unicode-aware.

This class serves as the interface between the Tang language and the ICU library.

5.60.2 Member Enumeration Documentation

5.60.2.1 Type

```
enum Tang::UnicodeString::Type
```

The types of string being created.

Enumerator

Trusted	String is from a trusted source.
Untrusted	String is not from a trusted source.
Percent	String is to be percent encoded.

5.60.3 Member Function Documentation**5.60.3.1 bytesLength()**

```
size_t UnicodeString::bytesLength () const
```

Return the length of the [UnicodeString](#) in bytes.

Note: this is *not* the number of codepoints or graphemes, but is the actual number of bytes in memory.

Returns

Returns the length of the [UnicodeString](#) in bytes.

5.60.3.2 length()

```
size_t UnicodeString::length () const
```

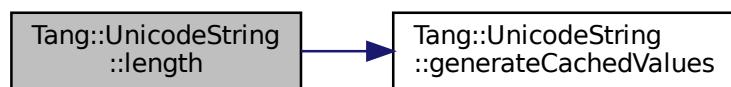
Return the length of the [UnicodeString](#) in graphemes.

Note: this is *not* the number of bytes, chars, or codepoints, but is the length in graphemes, as defined by ICU.

Returns

Returns the length of the [UnicodeString](#) in graphemes.

Here is the call graph for this function:



5.60.3.3 operator std::string()

```
UnicodeString::operator std::string ( ) const
```

Cast the current [UnicodeString](#) object to a std::string, UTF-8 encoded.

Returns

Returns the std::string version of the [UnicodeString](#).

5.60.3.4 operator+()

```
UnicodeString UnicodeString::operator+ (
    const UnicodeString & rhs ) const
```

Create a new [UnicodeString](#) that is the concatenation of two UnicodeStrings.

Parameters

<i>rhs</i>	The string to append to the current object string.
------------	--

Returns

Returns the result of the concatenation.

5.60.3.5 operator+=()

```
UnicodeString & UnicodeString::operator+= (
    const UnicodeString & rhs )
```

Concatenate the *rhs* [UnicodeString](#) to the current [UnicodeString](#).

Parameters

<i>rhs</i>	The string to append to the current object string.
------------	--

Returns

Returns the result of the concatenation.

5.60.3.6 operator<()

```
bool UnicodeString::operator< (
    const UnicodeString & rhs ) const
```

Compare two UnicodeStrings.

Parameters

<i>rhs</i>	The string to compare against.
------------	--------------------------------

Returns

Returns true if the rhs string is greater than or equal to the object string.

5.60.3.7 operator==()

```
bool UnicodeString::operator== (
    const UnicodeString & rhs ) const
```

Compare two UnicodeStrings.

Parameters

<i>rhs</i>	The string to compare against.
------------	--------------------------------

Returns

Returns true if the two strings are equal.

5.60.3.8 render()

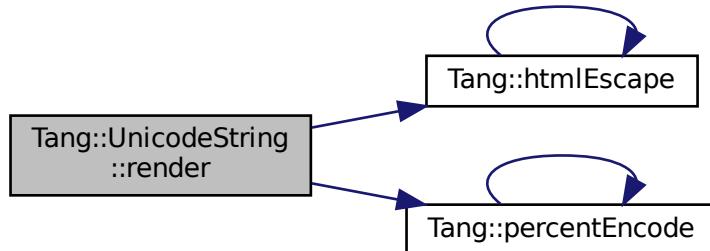
```
string UnicodeString::render ( ) const
```

Render the string in with dangerous characters HTML encoded, if the string is UnicodeString::Type::Untrusted.

Returns

The rendered string, according to its type.

Here is the call graph for this function:

**5.60.3.9 renderAscii()**

```
string UnicodeString::renderAscii () const
```

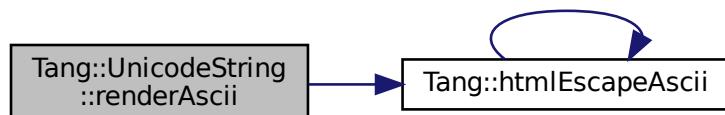
Render the string in with all characters converted to an ASCII representation.

The dangerous characters will not be HTML encoded, if the string is `UnicodeString::Type::Trusted`.

Returns

The rendered string, according to its type.

Here is the call graph for this function:

**5.60.3.10 substr()**

```
std::string UnicodeString::substr (
    size_t position,
    size_t length ) const
```

Return a Unicode grapheme-aware substring.

Parameters

<i>position</i>	The 0-based position of the first grapheme.
<i>length</i>	The maximum number of graphemes to return.

Returns

The requested substring.

Here is the call graph for this function:



The documentation for this class was generated from the following files:

- include/unicodeString.hpp
- src/unicodeString.cpp

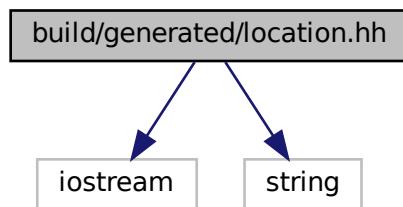
Chapter 6

File Documentation

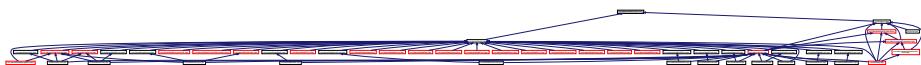
6.1 build/generated/location.hh File Reference

Define the Tang ::location class.

```
#include <iostream>
#include <string>
Include dependency graph for location.hh:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::position](#)
A point in a source file.
- class [Tang::location](#)
Two points in a source file.

Macros

- `#define YY_NULLPTR ((void*)0)`

Functions

- `position & Tang::operator+= (position &res, position::counter_type width)`
Add width columns, in place.
- `position Tang::operator+ (position res, position::counter_type width)`
Add width columns.
- `position & Tang::operator-= (position &res, position::counter_type width)`
Subtract width columns, in place.
- `position Tang::operator- (position res, position::counter_type width)`
Subtract width columns.
- `template<typename YYChar >`
`std::basic_ostream< YYChar > & Tang::operator<< (std::basic_ostream< YYChar > &ostr, const position &pos)`
Intercept output stream redirection.
- `location & Tang::operator+= (location &res, const location &end)`
Join two locations, in place.
- `location Tang::operator+ (location res, const location &end)`
Join two locations.
- `location & Tang::operator+= (location &res, location::counter_type width)`
Add width columns to the end position, in place.
- `location Tang::operator+ (location res, location::counter_type width)`
Add width columns to the end position.
- `location & Tang::operator-= (location &res, location::counter_type width)`
Subtract width columns to the end position, in place.
- `location Tang::operator- (location res, location::counter_type width)`
Subtract width columns to the end position.
- `template<typename YYChar >`
`std::basic_ostream< YYChar > & Tang::operator<< (std::basic_ostream< YYChar > &ostr, const location &loc)`
Intercept output stream redirection.

6.1.1 Detailed Description

Define the Tang ::location class.

6.1.2 Function Documentation

6.1.2.1 operator<<() [1/2]

```
template<typename YYChar >
std::basic_ostream<YYChar>& Tang::operator<< (
    std::basic_ostream< YYChar > & ostr,
    const location & loc )
```

Intercept output stream redirection.

Parameters

<i>ostr</i>	the destination output stream
<i>loc</i>	a reference to the location to redirect

Avoid duplicate information.

6.1.2.2 operator<<() [2/2]

```
template<typename YYChar >
std::basic_ostream<YYChar>& Tang::operator<< (
    std::basic_ostream< YYChar > & ostr,
    const position & pos )
```

Intercept output stream redirection.

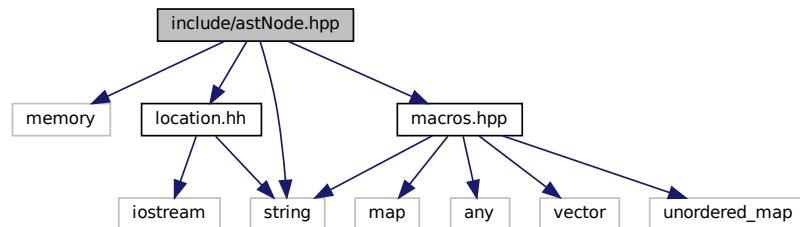
Parameters

<i>ostr</i>	the destination output stream
<i>pos</i>	a reference to the position to redirect

6.2 include/astNode.hpp File Reference

Declare the [Tang::AstNode](#) base class.

```
#include <memory>
#include <string>
#include "location.hh"
#include "macros.hpp"
Include dependency graph for astNode.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNode](#)
Base class for representing nodes of an Abstract Syntax Tree (AST).

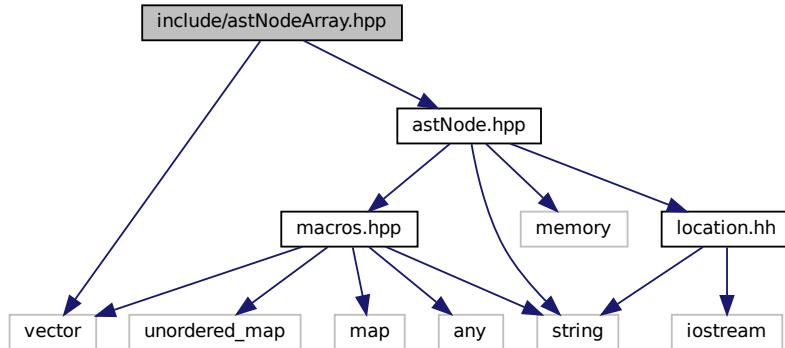
6.2.1 Detailed Description

Declare the [Tang::AstNode](#) base class.

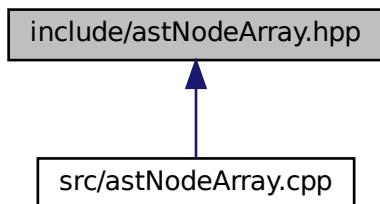
6.3 include/astNodeArray.hpp File Reference

Declare the [Tang::AstNodeArray](#) class.

```
#include <vector>
#include "astNode.hpp"
Include dependency graph for astNodeArray.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeArray](#)
An [AstNode](#) that represents an array literal.

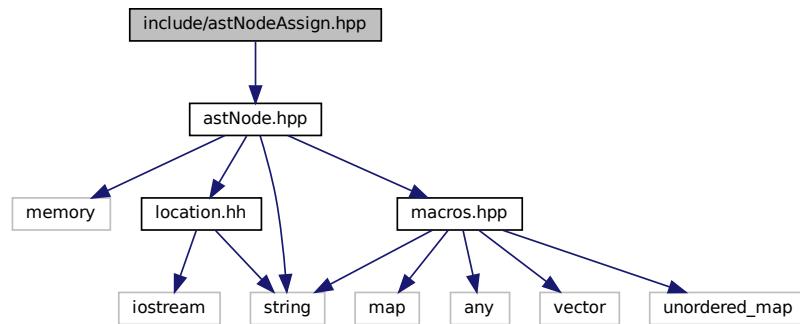
6.3.1 Detailed Description

Declare the [Tang::AstNodeArray](#) class.

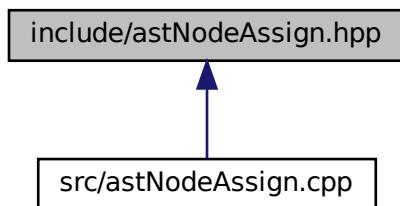
6.4 include/astNodeAssign.hpp File Reference

Declare the [Tang::AstNodeAssign](#) class.

```
#include "astNode.hpp"
Include dependency graph for astNodeAssign.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeAssign](#)
An [AstNode](#) that represents a binary expression.

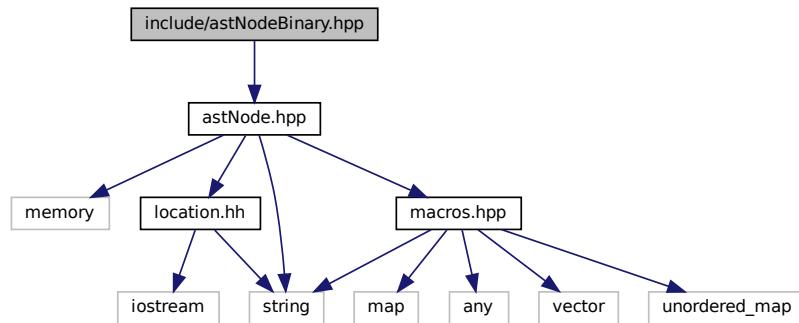
6.4.1 Detailed Description

Declare the [Tang::AstNodeAssign](#) class.

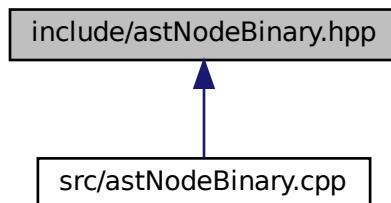
6.5 include/astNodeBinary.hpp File Reference

Declare the [Tang::AstNodeBinary](#) class.

```
#include "astNode.hpp"
Include dependency graph for astNodeBinary.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeBinary](#)
An `AstNode` that represents a binary expression.

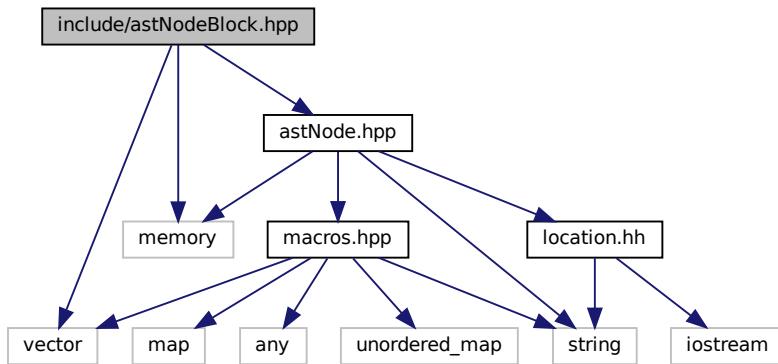
6.5.1 Detailed Description

Declare the [Tang::AstNodeBinary](#) class.

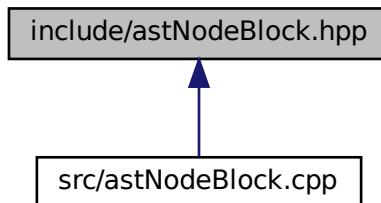
6.6 include/astNodeBlock.hpp File Reference

Declare the [Tang::AstNodeBlock](#) class.

```
#include <vector>
#include <memory>
#include "astNode.hpp"
Include dependency graph for astNodeBlock.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeBlock](#)
An `AstNode` that represents a code block.

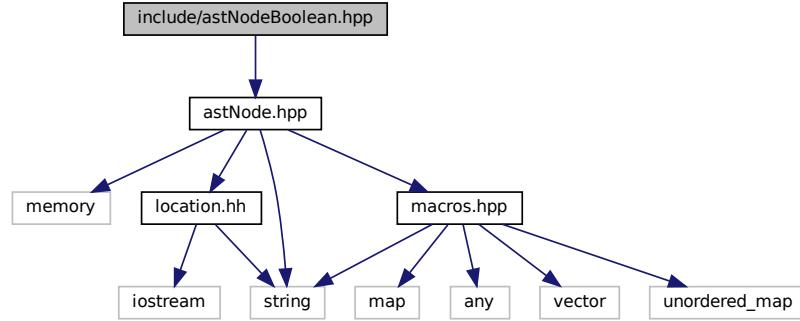
6.6.1 Detailed Description

Declare the [Tang::AstNodeBlock](#) class.

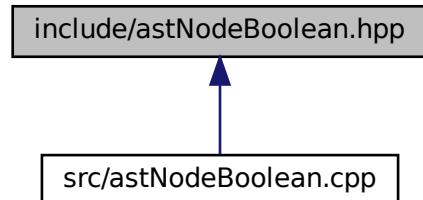
6.7 include/astNodeBoolean.hpp File Reference

Declare the [Tang::AstNodeBoolean](#) class.

```
#include "astNode.hpp"
Include dependency graph for astNodeBoolean.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeBoolean](#)
An `AstNode` that represents a boolean literal.

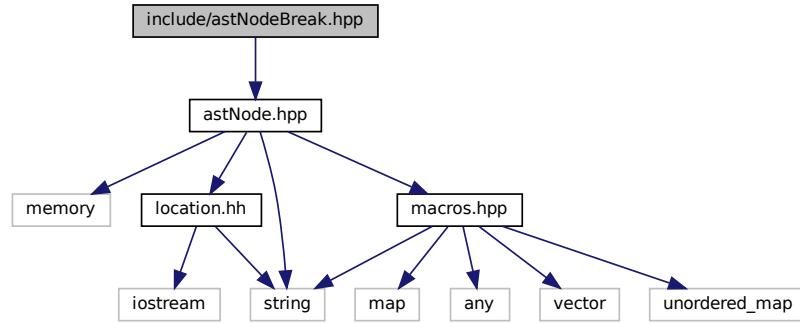
6.7.1 Detailed Description

Declare the [Tang::AstNodeBoolean](#) class.

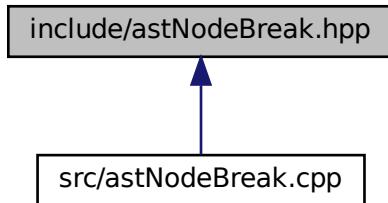
6.8 include/astNodeBreak.hpp File Reference

Declare the [Tang::AstNodeBreak](#) class.

```
#include "astNode.hpp"
Include dependency graph for astNodeBreak.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeBreak](#)
An `AstNode` that represents a `break` statement.

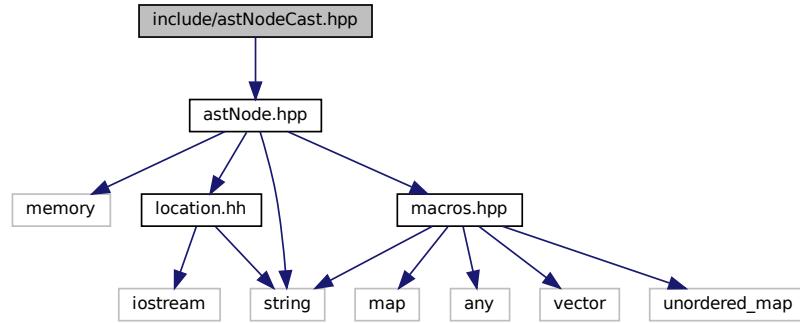
6.8.1 Detailed Description

Declare the [Tang::AstNodeBreak](#) class.

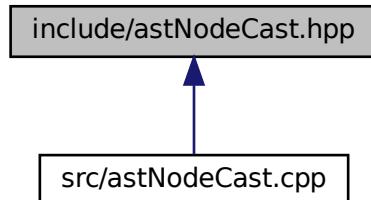
6.9 include/astNodeCast.hpp File Reference

Declare the [Tang::AstNodeCast](#) class.

```
#include "astNode.hpp"
Include dependency graph for astNodeCast.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeCast](#)
An `AstNode` that represents a typecast of an expression.

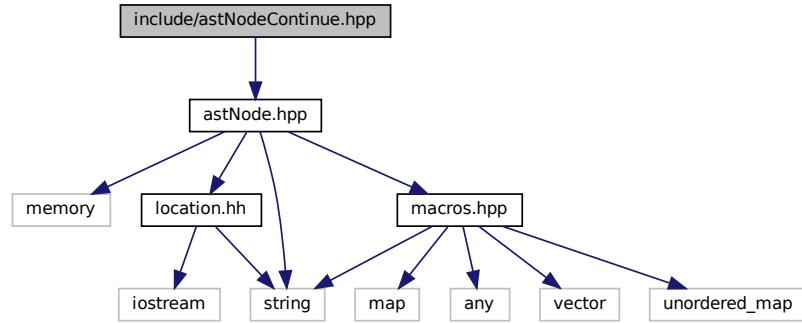
6.9.1 Detailed Description

Declare the [Tang::AstNodeCast](#) class.

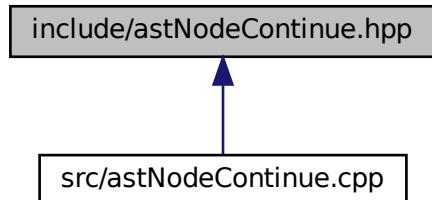
6.10 include/astNodeContinue.hpp File Reference

Declare the [Tang::AstNodeContinue](#) class.

```
#include "astNode.hpp"
Include dependency graph for astNodeContinue.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeContinue](#)
An `AstNode` that represents a `continue` statement.

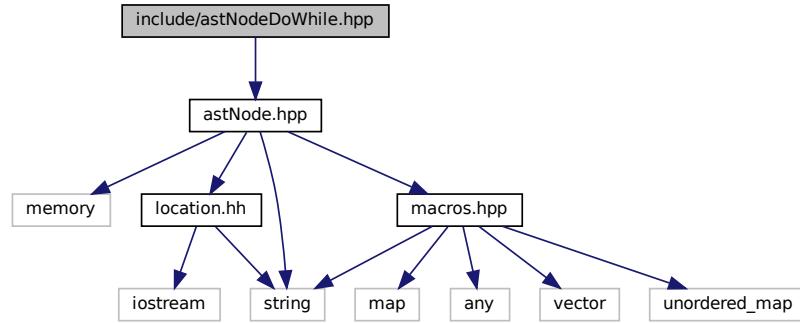
6.10.1 Detailed Description

Declare the [Tang::AstNodeContinue](#) class.

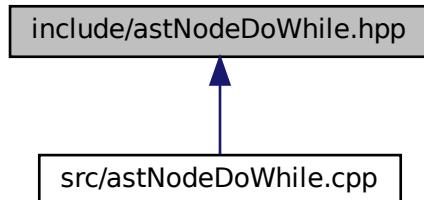
6.11 include/astNodeDoWhile.hpp File Reference

Declare the [Tang::AstNodeDoWhile](#) class.

```
#include "astNode.hpp"
Include dependency graph for astNodeDoWhile.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeDoWhile](#)
An `AstNode` that represents a do..while statement.

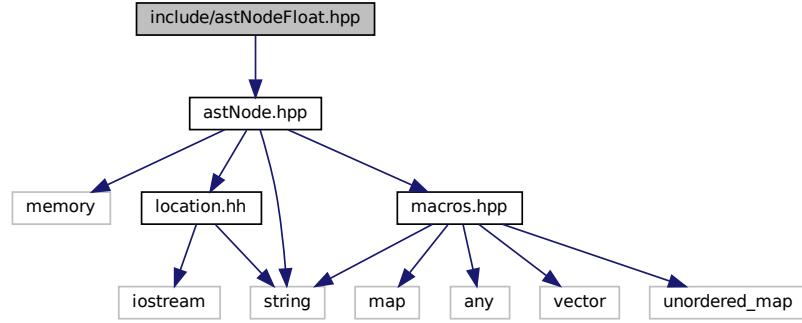
6.11.1 Detailed Description

Declare the [Tang::AstNodeDoWhile](#) class.

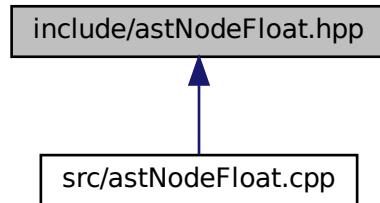
6.12 include/astNodeFloat.hpp File Reference

Declare the [Tang::AstNodeFloat](#) class.

```
#include "astNode.hpp"
Include dependency graph for astNodeFloat.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeFloat](#)
An `AstNode` that represents an float literal.

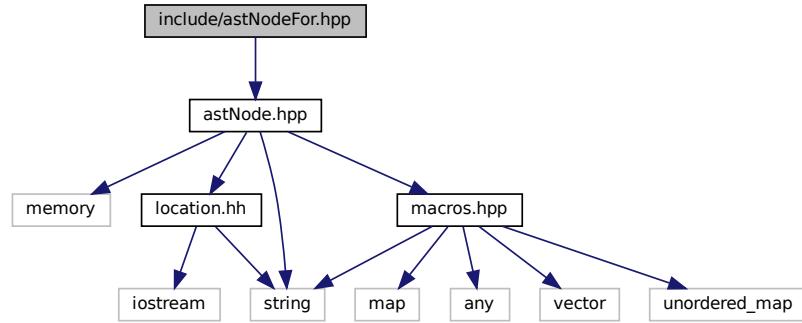
6.12.1 Detailed Description

Declare the [Tang::AstNodeFloat](#) class.

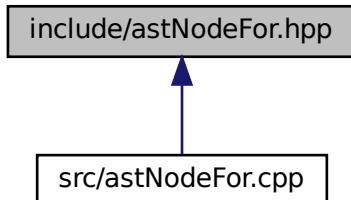
6.13 include/astNodeFor.hpp File Reference

Declare the [Tang::AstNodeFor](#) class.

```
#include "astNode.hpp"
Include dependency graph for astNodeFor.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeFor](#)
An `AstNode` that represents an if() statement.

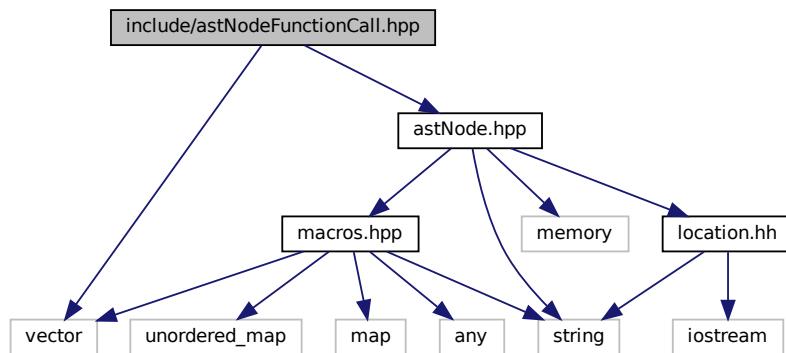
6.13.1 Detailed Description

Declare the [Tang::AstNodeFor](#) class.

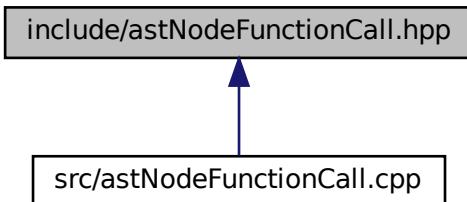
6.14 include/astNodeFunctionCall.hpp File Reference

Declare the [Tang::AstNodeFunctionCall](#) class.

```
#include <vector>
#include "astNode.hpp"
Include dependency graph for astNodeFunctionCall.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeFunctionCall](#)
An `AstNode` that represents a function call.

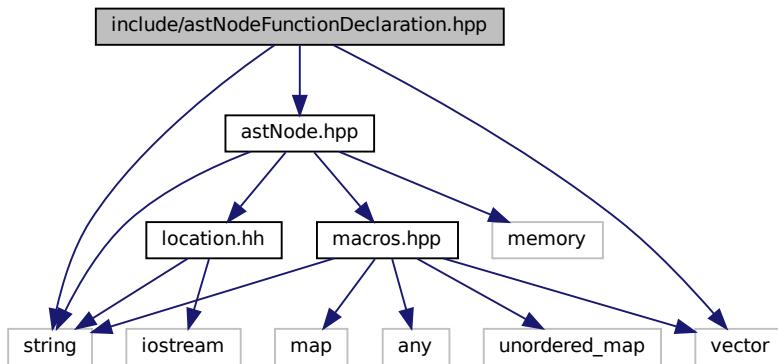
6.14.1 Detailed Description

Declare the [Tang::AstNodeFunctionCall](#) class.

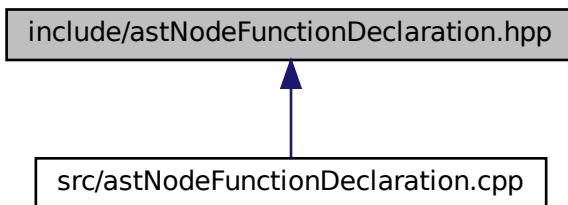
6.15 include/astNodeFunctionDeclaration.hpp File Reference

Declare the [Tang::AstNodeFunctionDeclaration](#) class.

```
#include <string>
#include <vector>
#include "astNode.hpp"
Include dependency graph for astNodeFunctionDeclaration.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeFunctionDeclaration](#)
An `AstNode` that represents a function declaration.

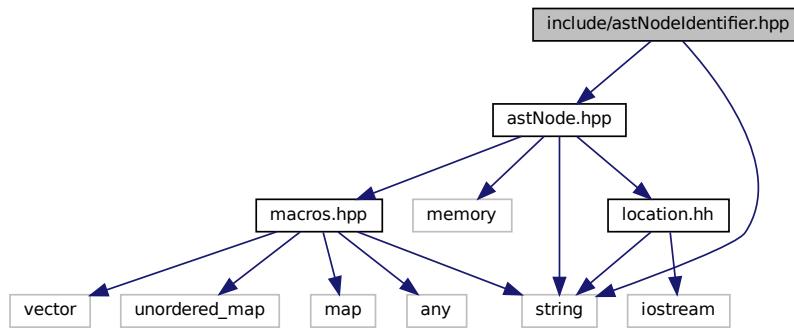
6.15.1 Detailed Description

Declare the [Tang::AstNodeFunctionDeclaration](#) class.

6.16 include/astNodentifier.hpp File Reference

Declare the [Tang::AstNodentifier](#) class.

```
#include <string>
#include "astNode.hpp"
Include dependency graph for astNodentifier.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodentifier](#)
An `AstNode` that represents an identifier.

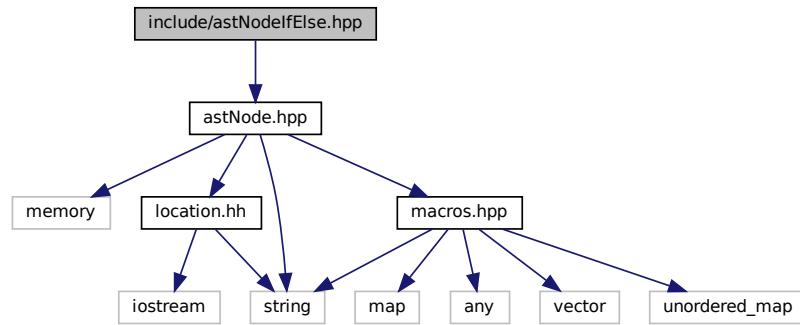
6.16.1 Detailed Description

Declare the [Tang::AstNodentifier](#) class.

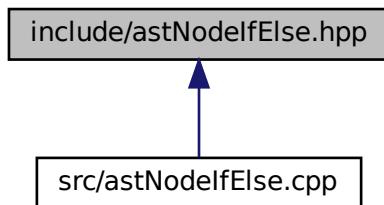
6.17 include/astNodelfElse.hpp File Reference

Declare the [Tang::AstNodelfElse](#) class.

```
#include "astNode.hpp"
Include dependency graph for astNodeIfElse.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeIfElse](#)
An `AstNode` that represents an if..else statement.

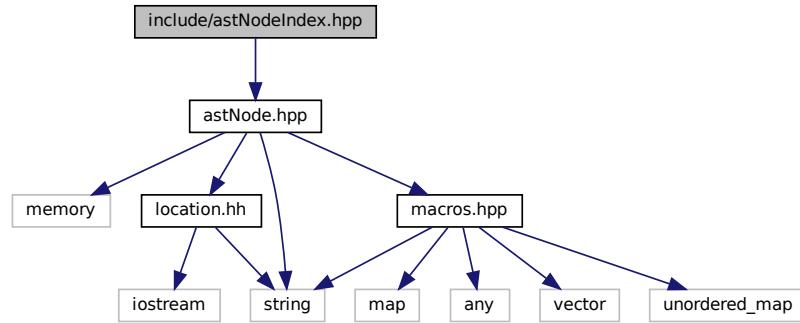
6.17.1 Detailed Description

Declare the [Tang::AstNodeIfElse](#) class.

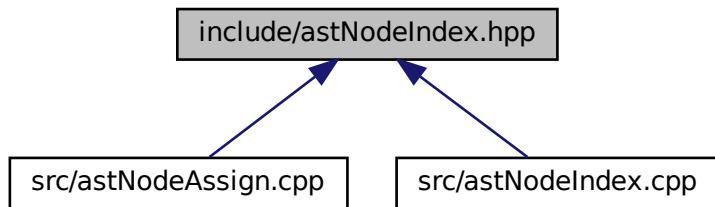
6.18 include/astNodeIndex.hpp File Reference

Declare the [Tang::AstNodeIndex](#) class.

```
#include "astNode.hpp"
Include dependency graph for astNodeIndex.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeIndex](#)
An `AstNode` that represents an index into a collection.

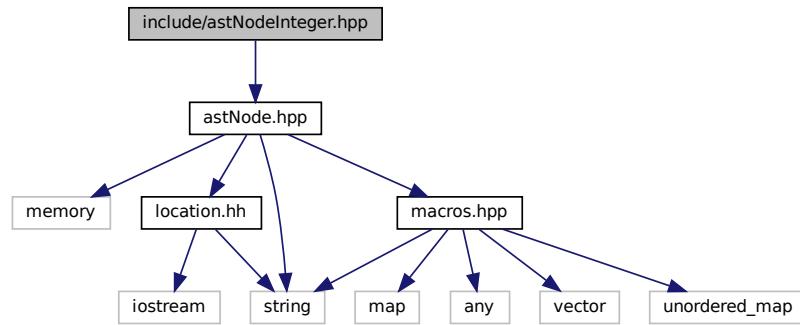
6.18.1 Detailed Description

Declare the [Tang::AstNodeIndex](#) class.

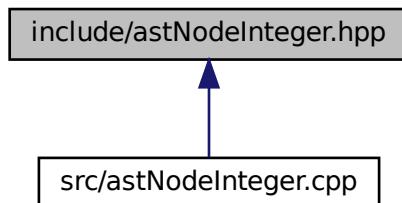
6.19 include/astNodeInteger.hpp File Reference

Declare the [Tang::AstNodeInteger](#) class.

```
#include "astNode.hpp"
Include dependency graph for astNodeInteger.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeInteger](#)
An `AstNode` that represents an integer literal.

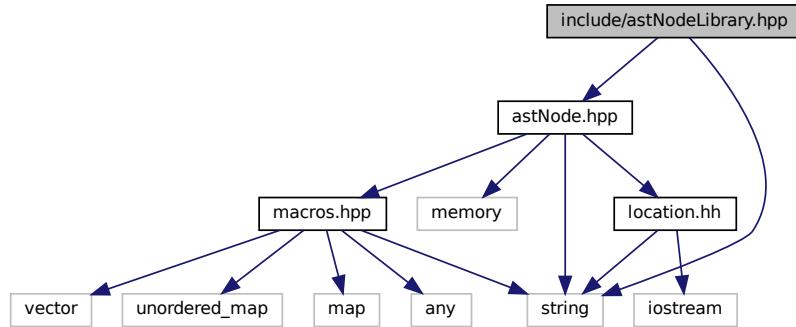
6.19.1 Detailed Description

Declare the [Tang::AstNodeInteger](#) class.

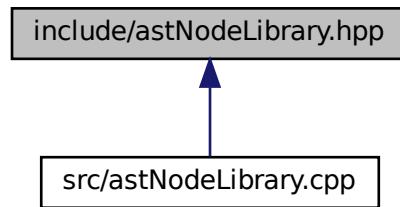
6.20 include/astNodeLibrary.hpp File Reference

Declare the [Tang::AstNodeLibrary](#) class.

```
#include <string>
#include "astNode.hpp"
Include dependency graph for astNodeLibrary.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeLibrary](#)
An `AstNode` that represents an identifier.

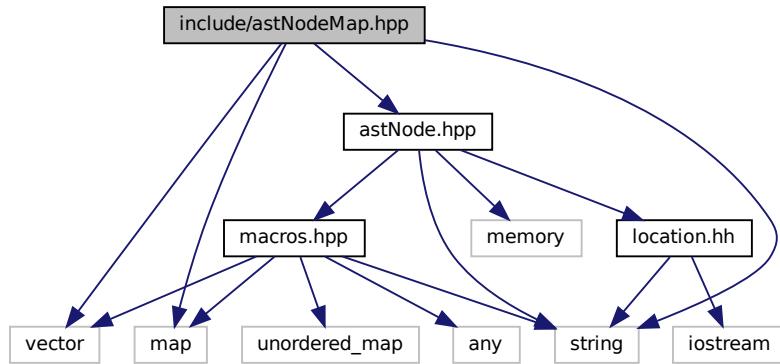
6.20.1 Detailed Description

Declare the [Tang::AstNodeLibrary](#) class.

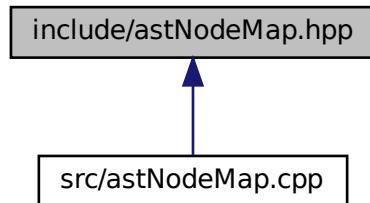
6.21 include/astNodeMap.hpp File Reference

Declare the [Tang::AstNodeMap](#) class.

```
#include <vector>
#include <map>
#include <string>
#include "astNode.hpp"
Include dependency graph for astNodeMap.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeMap](#)
An `AstNode` that represents a map literal.

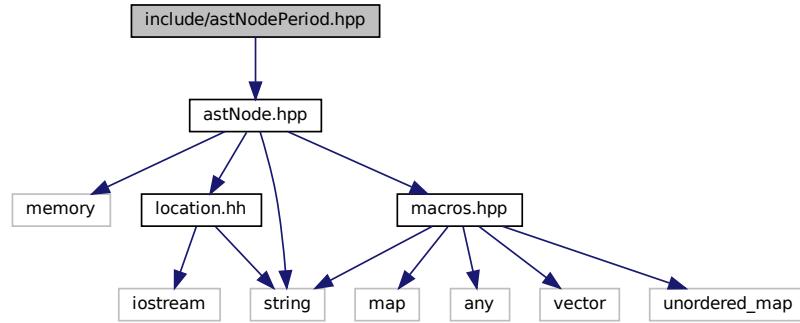
6.21.1 Detailed Description

Declare the [Tang::AstNodeMap](#) class.

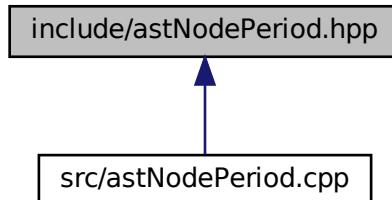
6.22 include/astNodePeriod.hpp File Reference

Declare the [Tang::AstNodePeriod](#) class.

```
#include "astNode.hpp"
Include dependency graph for astNodePeriod.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodePeriod](#)

An *AstNode* that represents a member access (period) into an object.

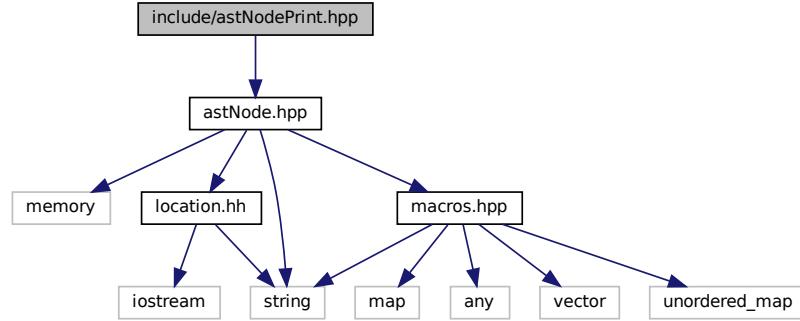
6.22.1 Detailed Description

Declare the [Tang::AstNodePeriod](#) class.

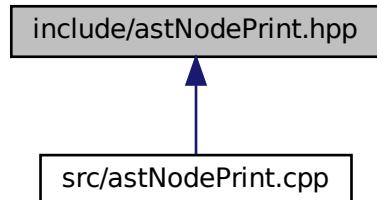
6.23 include/astNodePrint.hpp File Reference

Declare the [Tang::AstNodePrint](#) class.

```
#include "astNode.hpp"
Include dependency graph for astNodePrint.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodePrint](#)
An `AstNode` that represents a print typeeration.

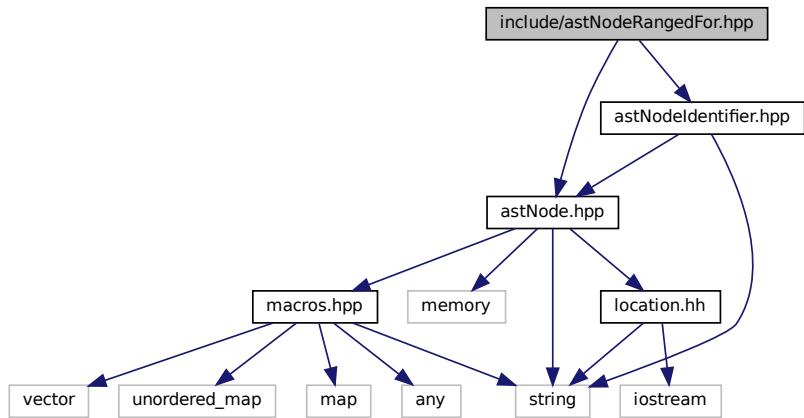
6.23.1 Detailed Description

Declare the [Tang::AstNodePrint](#) class.

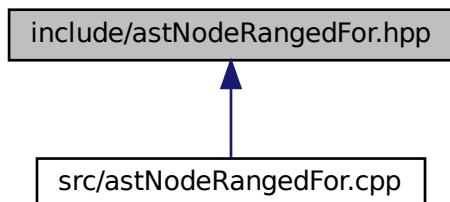
6.24 include/astNodeRangedFor.hpp File Reference

Declare the [Tang::AstNodeRangedFor](#) class.

```
#include "astNode.hpp"
#include "astNodeIdentifier.hpp"
Include dependency graph for astNodeRangedFor.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeRangedFor](#)
An `AstNode` that represents a ranged for() statement.

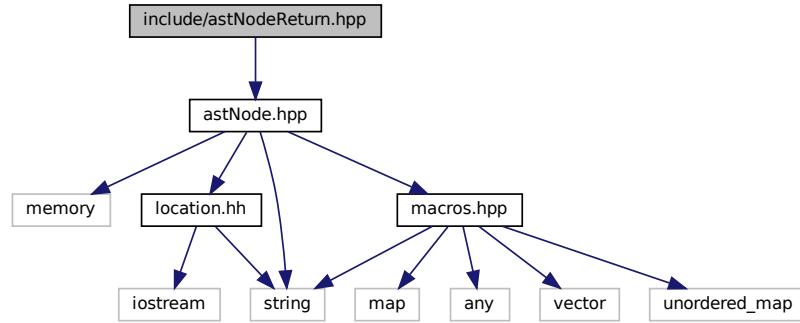
6.24.1 Detailed Description

Declare the [Tang::AstNodeRangedFor](#) class.

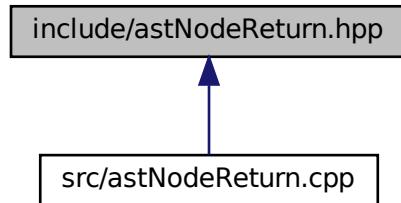
6.25 include/astNodeReturn.hpp File Reference

Declare the [Tang::AstNodeReturn](#) class.

```
#include "astNode.hpp"
Include dependency graph for astNodeReturn.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeReturn](#)

An `AstNode` that represents a return statement.

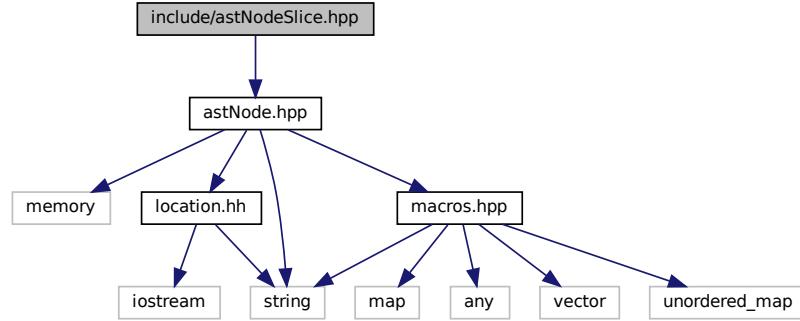
6.25.1 Detailed Description

Declare the [Tang::AstNodeReturn](#) class.

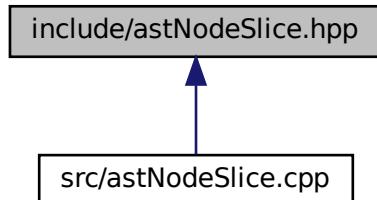
6.26 include/astNodeSlice.hpp File Reference

Declare the [Tang::AstNodeSlice](#) class.

```
#include "astNode.hpp"
Include dependency graph for astNodeSlice.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeSlice](#)
An `AstNode` that represents a ternary expression.

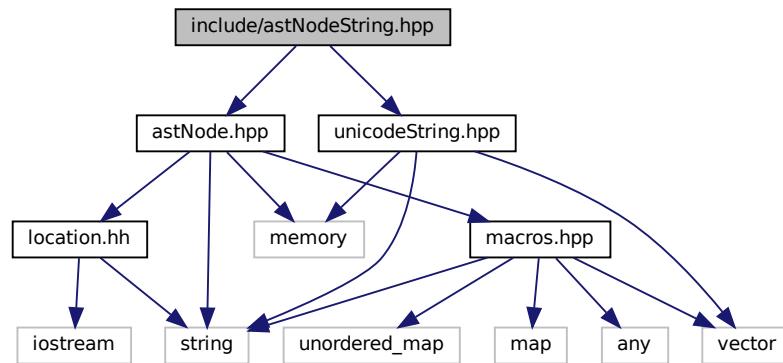
6.26.1 Detailed Description

Declare the [Tang::AstNodeSlice](#) class.

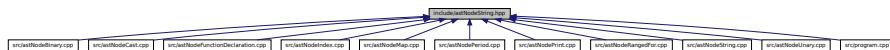
6.27 include/astNodeString.hpp File Reference

Declare the [Tang::AstNodeString](#) class.

```
#include "astNode.hpp"
#include "unicodeString.hpp"
Include dependency graph for astNodeString.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeString](#)
An `AstNode` that represents a string literal.

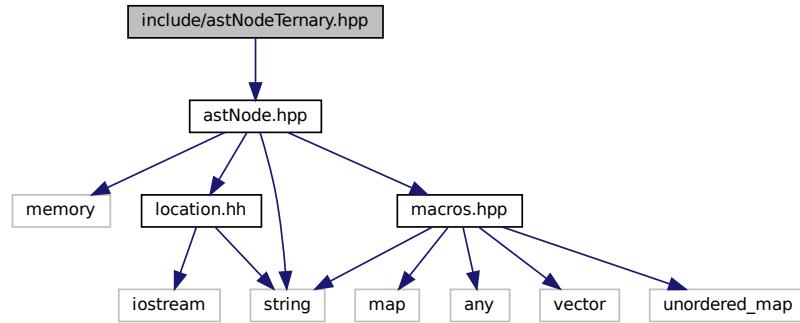
6.27.1 Detailed Description

Declare the [Tang::AstNodeString](#) class.

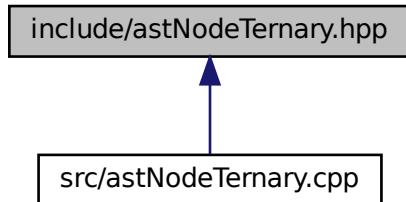
6.28 include/astNodeTernary.hpp File Reference

Declare the [Tang::AstNodeTernary](#) class.

```
#include "astNode.hpp"
Include dependency graph for astNodeTernary.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeTernary](#)
An `AstNode` that represents a ternary expression.

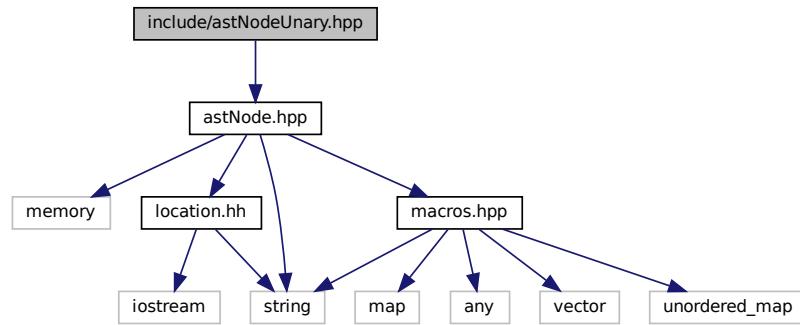
6.28.1 Detailed Description

Declare the [Tang::AstNodeTernary](#) class.

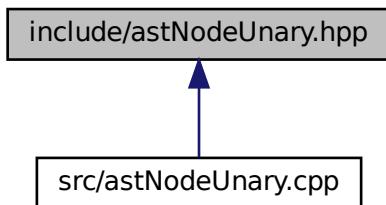
6.29 include/astNodeUnary.hpp File Reference

Declare the [Tang::AstNodeUnary](#) class.

```
#include "astNode.hpp"
Include dependency graph for astNodeUnary.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeUnary](#)
An `AstNode` that represents a unary negation.

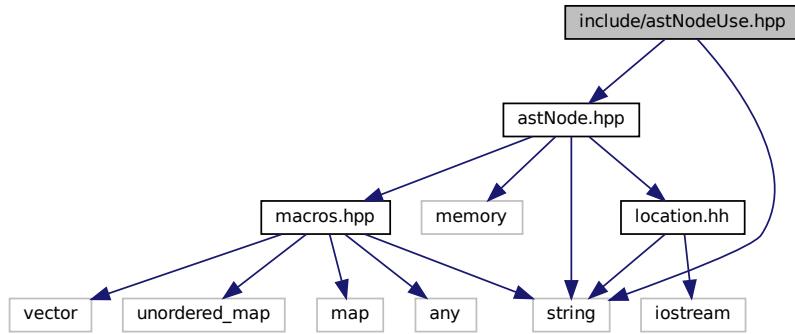
6.29.1 Detailed Description

Declare the [Tang::AstNodeUnary](#) class.

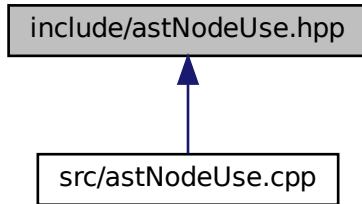
6.30 include/astNodeUse.hpp File Reference

Declare the [Tang::AstNodeUse](#) class.

```
#include <string>
#include "astNode.hpp"
Include dependency graph for astNodeUse.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeUse](#)
An `AstNode` that represents the inclusion of a library into the script.

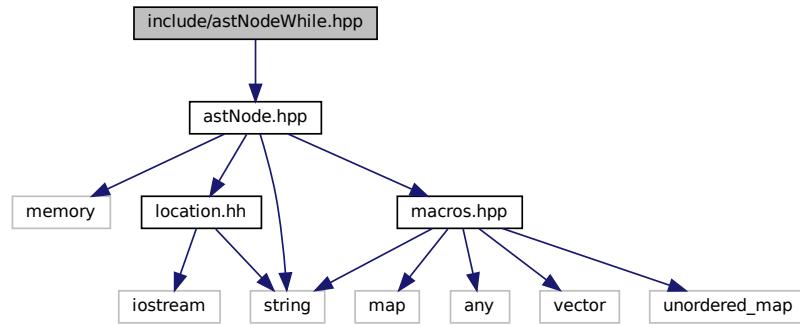
6.30.1 Detailed Description

Declare the `Tang::AstNodeUse` class.

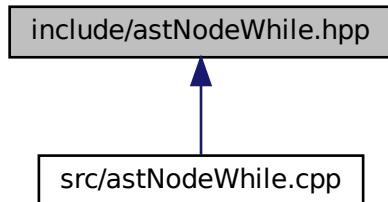
6.31 include/astNodeWhile.hpp File Reference

Declare the `Tang::AstNodeWhile` class.

```
#include "astNode.hpp"
Include dependency graph for astNodeWhile.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::AstNodeWhile](#)
An `AstNode` that represents a while statement.

6.31.1 Detailed Description

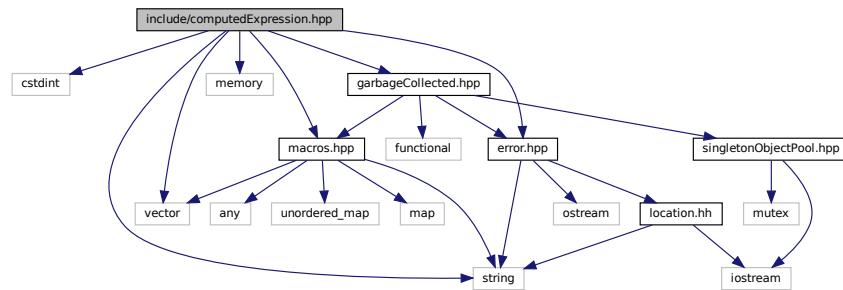
Declare the [Tang::AstNodeWhile](#) class.

6.32 include/computedExpression.hpp File Reference

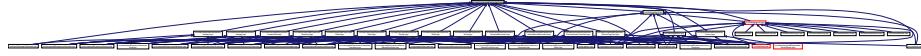
Declare the [Tang::ComputedExpression](#) base class.

```
#include <cstdint>
#include <string>
```

```
#include <vector>
#include <memory>
#include "macros.hpp"
#include "garbageCollected.hpp"
#include "error.hpp"
Include dependency graph for computedExpression.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::ComputedExpression](#)
Represents the result of a computation that has been executed.

6.32.1 Detailed Description

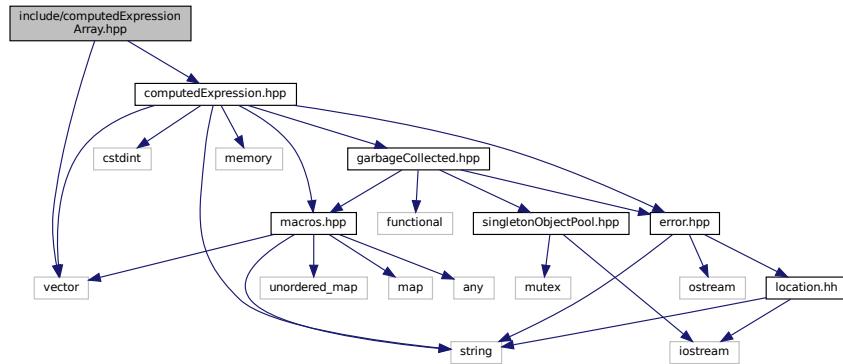
Declare the [Tang::ComputedExpression](#) base class.

6.33 include/computedExpressionArray.hpp File Reference

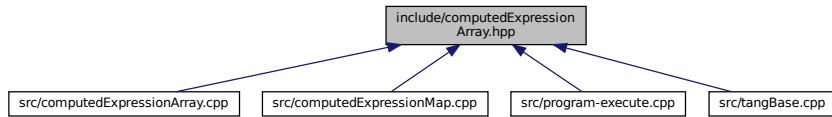
Declare the [Tang::ComputedExpressionArray](#) class.

```
#include <vector>
#include "computedExpression.hpp"
```

Include dependency graph for computedExpressionArray.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::ComputedExpressionArray](#)
Represents an Array that is the result of a computation.

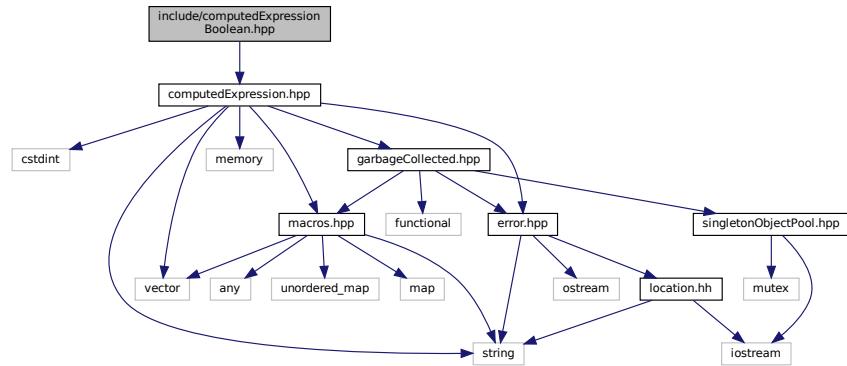
6.33.1 Detailed Description

Declare the [Tang::ComputedExpressionArray](#) class.

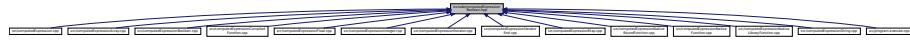
6.34 include/computedExpressionBoolean.hpp File Reference

Declare the [Tang::ComputedExpressionBoolean](#) class.

```
#include "computedExpression.hpp"
Include dependency graph for computedExpressionBoolean.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::ComputedExpressionBoolean](#)
Represents an Boolean that is the result of a computation.

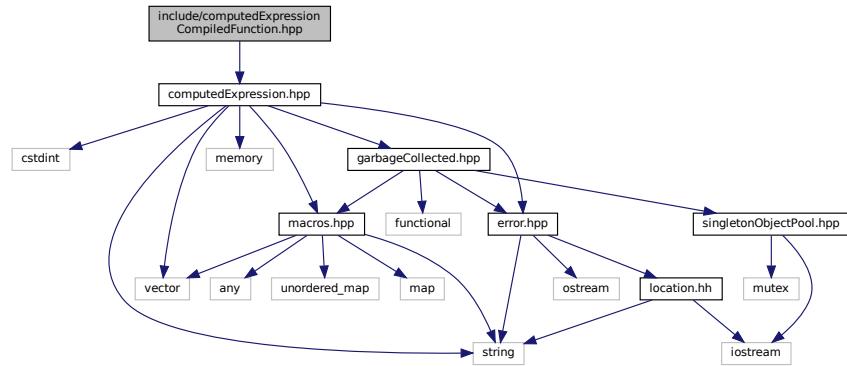
6.34.1 Detailed Description

Declare the [Tang::ComputedExpressionBoolean](#) class.

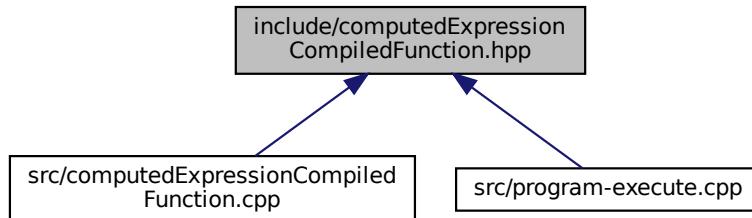
6.35 include/computedExpressionCompiledFunction.hpp File Reference

Declare the [Tang::ComputedExpressionCompiledFunction](#) class.

```
#include "computedExpression.hpp"
Include dependency graph for computedExpressionCompiledFunction.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::ComputedExpressionCompiledFunction](#)
Represents a Compiled Function declared in the script.

6.35.1 Detailed Description

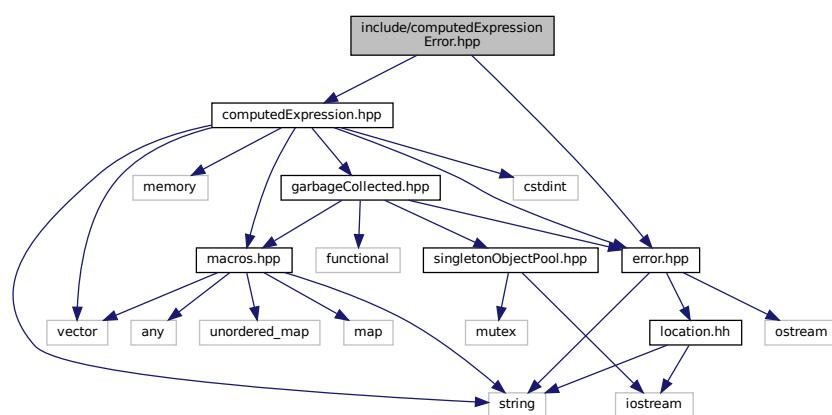
Declare the [Tang::ComputedExpressionCompiledFunction](#) class.

6.36 include/computedExpressionError.hpp File Reference

Declare the [Tang::ComputedExpressionError](#) class.

```
#include "computedExpression.hpp"
#include "error.hpp"
```

Include dependency graph for computedExpressionError.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::ComputedExpressionError](#)

Represents a Runtime Error.

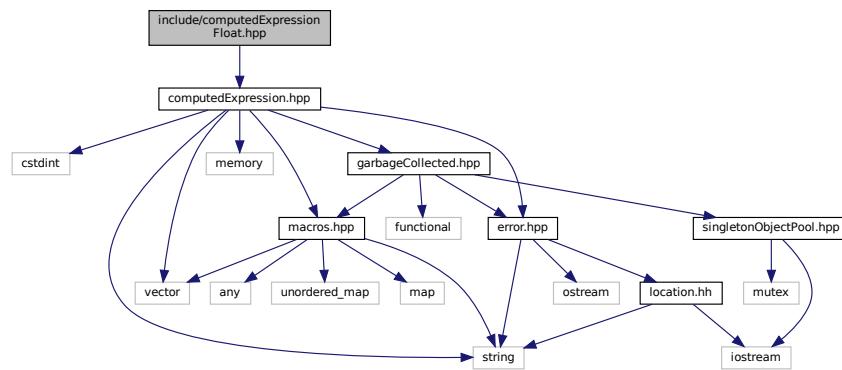
6.36.1 Detailed Description

Declare the [Tang::ComputedExpressionError](#) class.

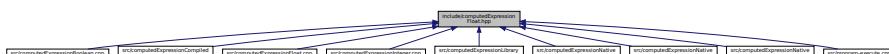
6.37 include/computedExpressionFloat.hpp File Reference

Declare the [Tang::ComputedExpressionFloat](#) class.

```
#include "computedExpression.hpp"
Include dependency graph for computedExpressionFloat.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::ComputedExpressionFloat](#)

Represents a Float that is the result of a computation.

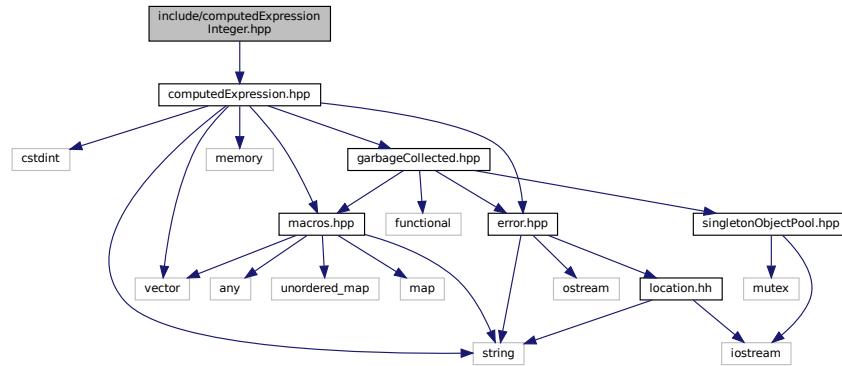
6.37.1 Detailed Description

Declare the [Tang::ComputedExpressionFloat](#) class.

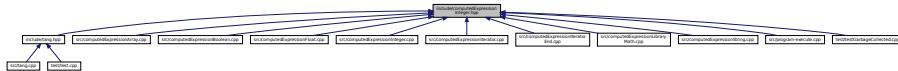
6.38 include/computedExpressionInteger.hpp File Reference

Declare the [Tang::ComputedExpressionInteger](#) class.

```
#include "computedExpression.hpp"
Include dependency graph for computedExpressionInteger.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::ComputedExpressionInteger](#)
Represents an Integer that is the result of a computation.

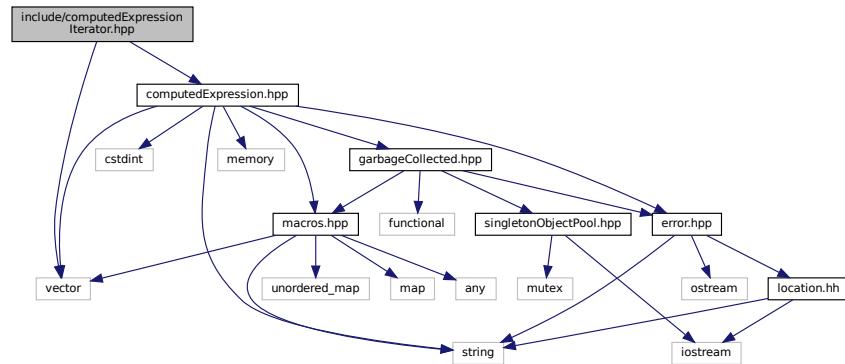
6.38.1 Detailed Description

Declare the [Tang::ComputedExpressionInteger](#) class.

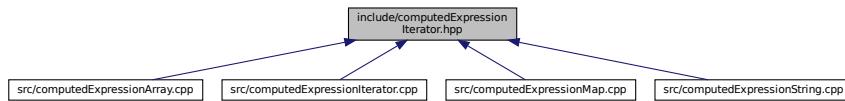
6.39 include/computedExpressionIterator.hpp File Reference

Declare the [Tang::ComputedExpressionIterator](#) class.

```
#include <vector>
#include "computedExpression.hpp"
Include dependency graph for computedExpressionIterator.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::ComputedExpressionIterator](#)
Represents an Iterator that is the result of a computation.

6.39.1 Detailed Description

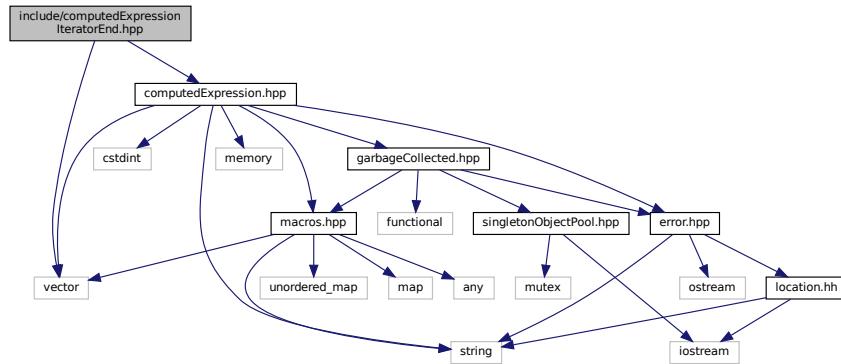
Declare the [Tang::ComputedExpressionIterator](#) class.

6.40 include/computedExpressionIteratorEnd.hpp File Reference

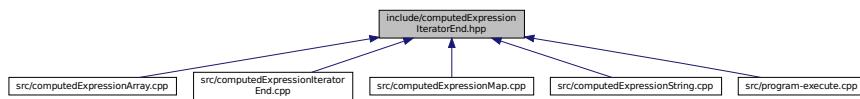
Declare the [Tang::ComputedExpressionIteratorEnd](#) class.

```
#include <vector>
#include "computedExpression.hpp"
```

Include dependency graph for computedExpressionIteratorEnd.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::ComputedExpressionIteratorEnd](#)
Represents that a collection has no more values through which to iterate.

6.40.1 Detailed Description

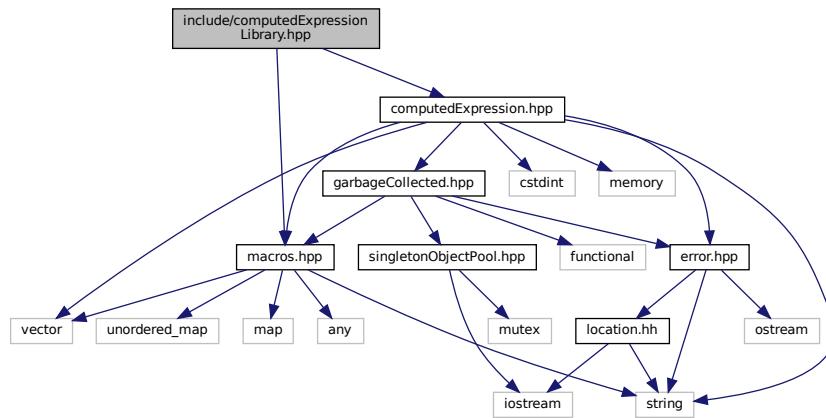
Declare the [Tang::ComputedExpressionIteratorEnd](#) class.

6.41 include/computedExpressionLibrary.hpp File Reference

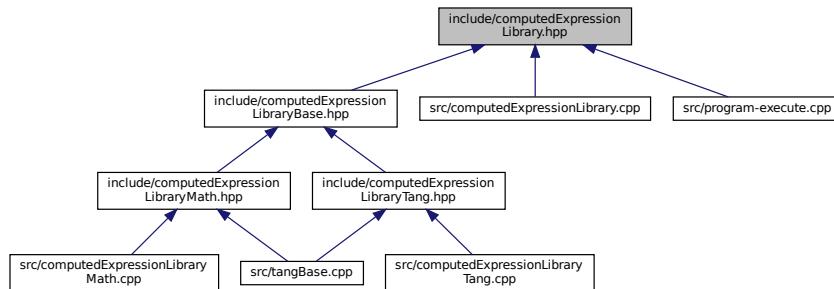
Declare the [Tang::ComputedExpressionLibrary](#) class.

```
#include "macros.hpp"
#include "computedExpression.hpp"
```

Include dependency graph for computedExpressionLibrary.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::ComputedExpressionLibrary](#)

Represents a Runtime Library.

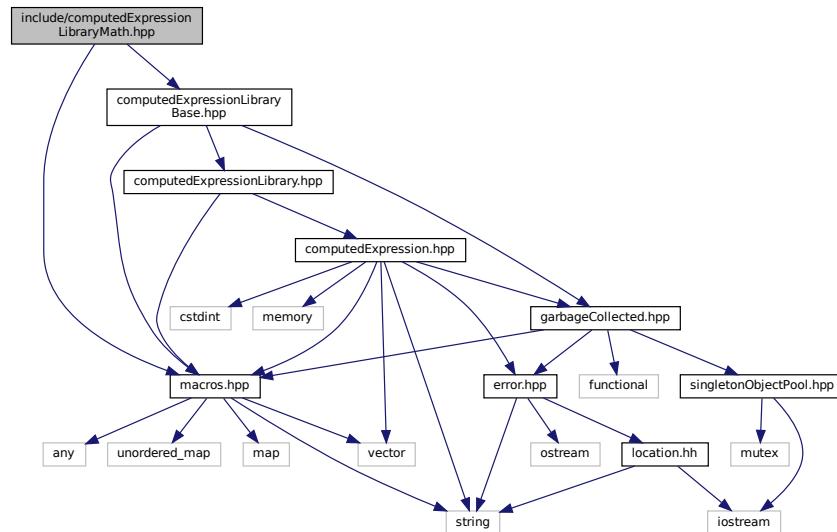
6.41.1 Detailed Description

Declare the [Tang::ComputedExpressionLibrary](#) class.

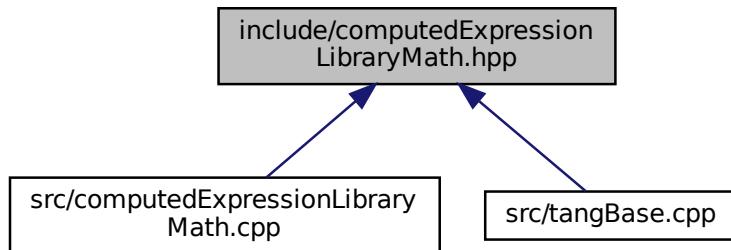
6.42 include/computedExpressionLibraryMath.hpp File Reference

Declare the [Tang::ComputedExpressionLibraryMath](#) class.

```
#include "macros.hpp"
#include "computedExpressionLibraryBase.hpp"
Include dependency graph for computedExpressionLibraryMath.hpp:
```



This graph shows which files directly or indirectly include this file:



Macros

- `#define ComputedExpressionLibraryBase ComputedExpressionLibraryMath`

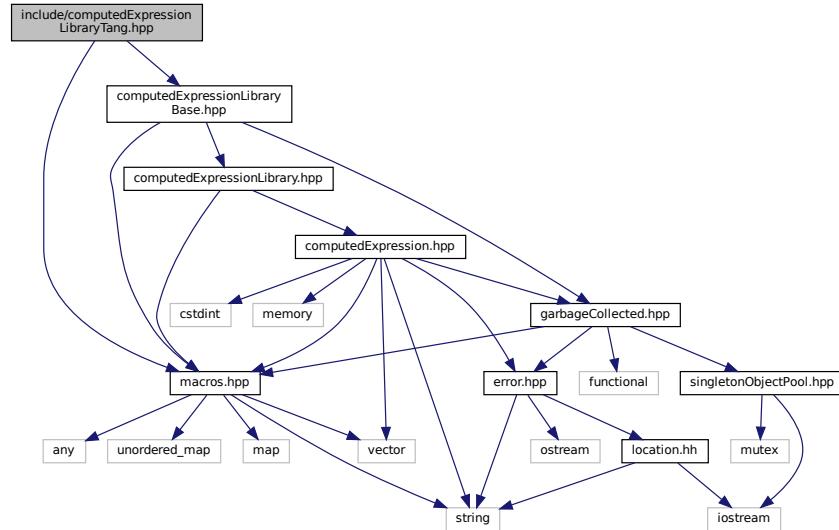
6.42.1 Detailed Description

Declare the `Tang::ComputedExpressionLibraryMath` class.

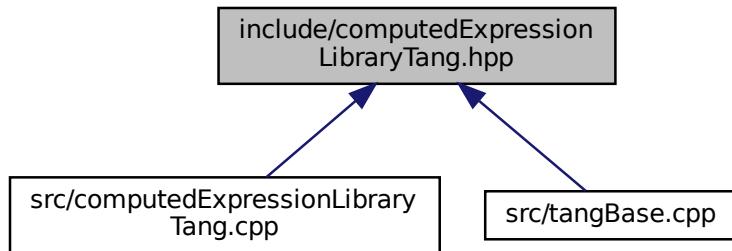
6.43 include/computedExpressionLibraryTang.hpp File Reference

Declare the Tang::ComputedExpressionLibraryTang class.

```
#include "macros.hpp"
#include "computedExpressionLibraryBase.hpp"
Include dependency graph for computedExpressionLibraryTang.hpp:
```



This graph shows which files directly or indirectly include this file:



Macros

- `#define ComputedExpressionLibraryBase ComputedExpressionLibraryTang`

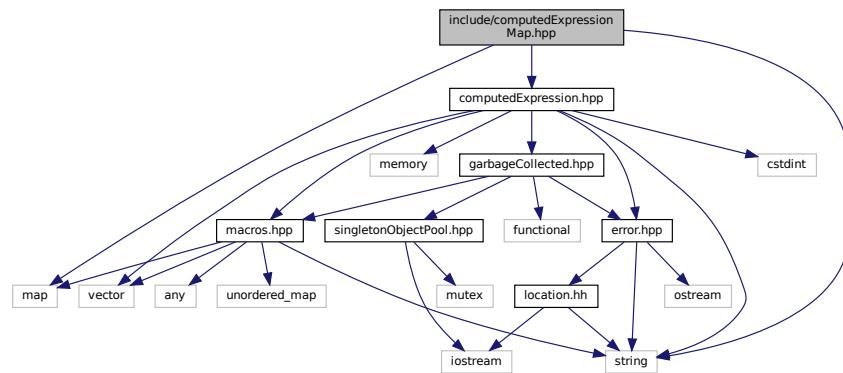
6.43.1 Detailed Description

Declare the Tang::ComputedExpressionLibraryTang class.

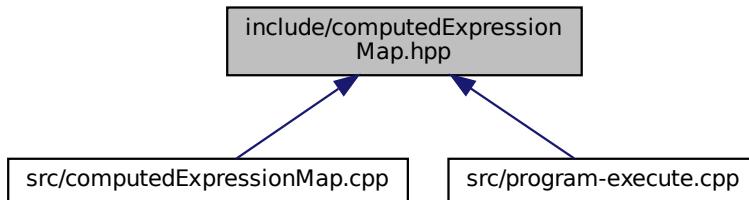
6.44 include/computedExpressionMap.hpp File Reference

Declare the [Tang::ComputedExpressionMap](#) class.

```
#include <map>
#include <string>
#include "computedExpression.hpp"
Include dependency graph for computedExpressionMap.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::ComputedExpressionMap](#)
Represents an Map that is the result of a computation.

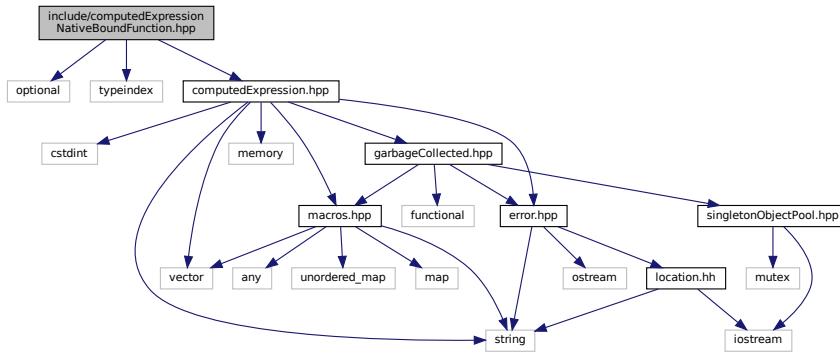
6.44.1 Detailed Description

Declare the [Tang::ComputedExpressionMap](#) class.

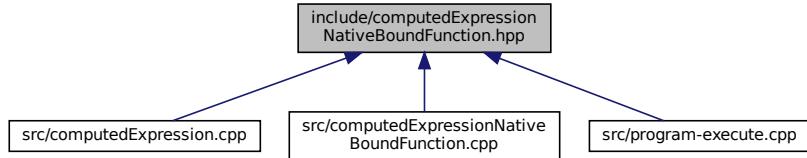
6.45 include/computedExpressionNativeBoundFunction.hpp File Reference

Declare the [Tang::ComputedExpressionNativeBoundFunction](#) class.

```
#include <optional>
#include <typeindex>
#include "computedExpression.hpp"
Include dependency graph for computedExpressionNativeBoundFunction.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::ComputedExpressionNativeBoundFunction](#)
Represents a NativeBound Function declared in the script.

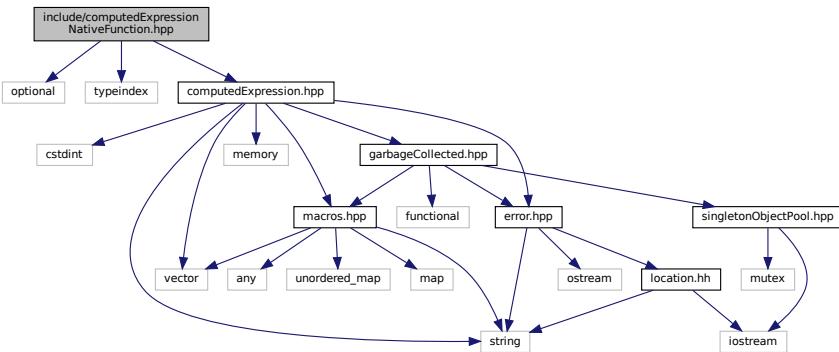
6.45.1 Detailed Description

Declare the [Tang::ComputedExpressionNativeBoundFunction](#) class.

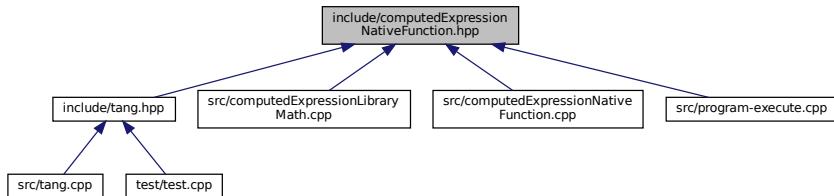
6.46 include/computedExpressionNativeFunction.hpp File Reference

Declare the [Tang::ComputedExpressionNativeFunction](#) class.

```
#include <optional>
#include <typeindex>
#include "computedExpression.hpp"
Include dependency graph for computedExpressionNativeFunction.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::ComputedExpressionNativeFunction](#)
Represents a Native Function provided by compiled C++ code.

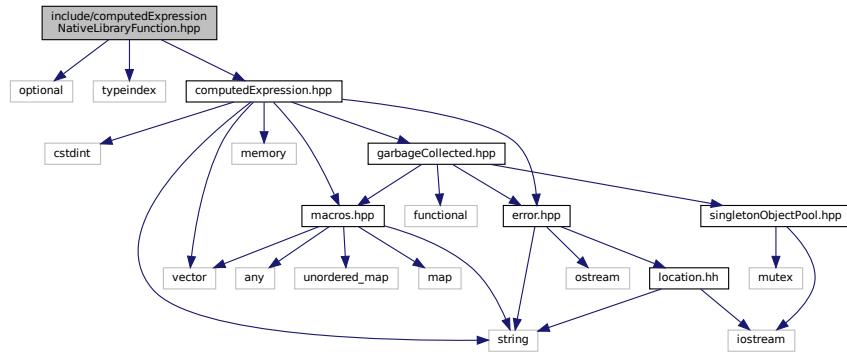
6.46.1 Detailed Description

Declare the [Tang::ComputedExpressionNativeFunction](#) class.

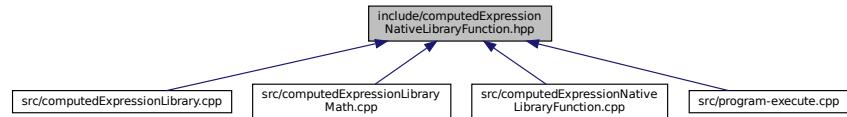
6.47 include/computedExpressionNativeLibraryFunction.hpp File Reference

Declare the [Tang::ComputedExpressionNativeLibraryFunction](#) class.

```
#include <optional>
#include <typeindex>
#include "computedExpression.hpp"
Include dependency graph for computedExpressionNativeLibraryFunction.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::ComputedExpressionNativeLibraryFunction](#)

Represents a Native Function provided by compiled C++ code that is executed to create a library or one of its attributes.

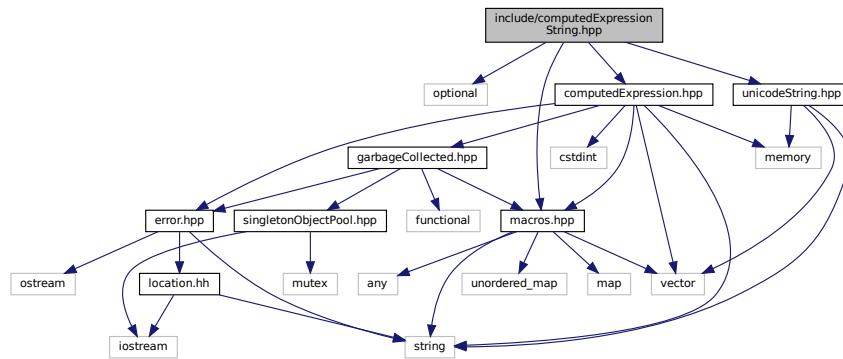
6.47.1 Detailed Description

Declare the [Tang::ComputedExpressionNativeLibraryFunction](#) class.

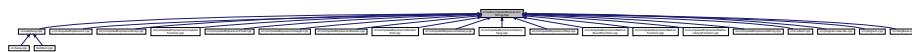
6.48 include/computedExpressionString.hpp File Reference

Declare the [Tang::ComputedExpressionString](#) class.

```
#include <optional>
#include "macros.hpp"
#include "computedExpression.hpp"
#include "unicodeString.hpp"
Include dependency graph for computedExpressionString.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::ComputedExpressionString](#)
Represents a String that is the result of a computation.

6.48.1 Detailed Description

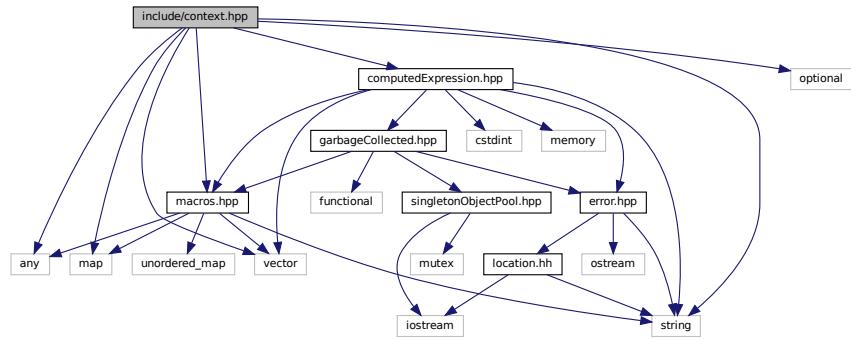
Declare the [Tang::ComputedExpressionString](#) class.

6.49 include/context.hpp File Reference

Declare the [Tang::Context](#) class.

```
#include <any>
#include <map>
#include <optional>
#include <string>
#include <vector>
```

```
#include "macros.hpp"
#include "computedExpression.hpp"
Include dependency graph for context.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::Context](#)
Holds all environment variables specific to the execution of a program.

6.49.1 Detailed Description

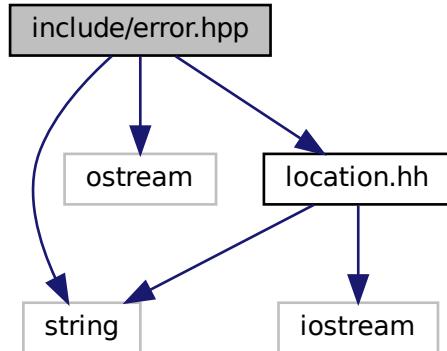
Declare the [Tang::Context](#) class.

6.50 include/error.hpp File Reference

Declare the [Tang::Error](#) class used to describe syntax and runtime errors.

```
#include <string>
#include <iostream>
```

```
#include "location.hh"
Include dependency graph for error.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::Error](#)

The [Error](#) class is used to report any error of the system, whether a syntax (parsing) error or a runtime (execution) error.

6.50.1 Detailed Description

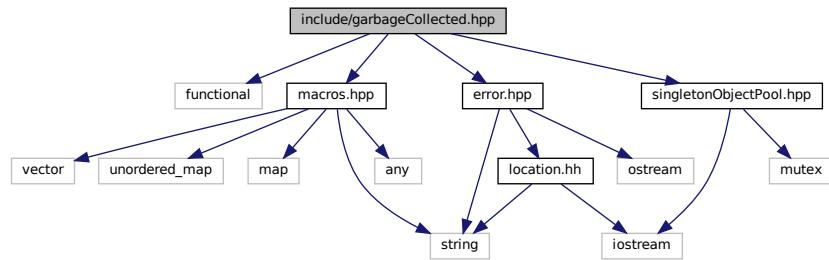
Declare the [Tang::Error](#) class used to describe syntax and runtime errors.

6.51 include/garbageCollected.hpp File Reference

Declare the [Tang::GarbageCollected](#) class.

```
#include <functional>
#include "macros.hpp"
#include "singletonObjectPool.hpp"
```

```
#include "error.hpp"
Include dependency graph for garbageCollected.hpp:
```



This graph shows which files directly or indirectly include this file:

Classes

- class [Tang::GarbageCollected](#)

A container that acts as a resource-counting garbage collector for the specified type.

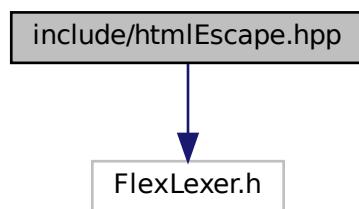
6.51.1 Detailed Description

Declare the [Tang::GarbageCollected](#) class.

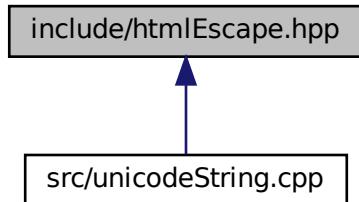
6.52 include/htmlEscape.hpp File Reference

Declare the [Tang::HtmlEscape](#) used to tokenize a Tang script.

```
#include <FlexLexer.h>
Include dependency graph for htmlEscape.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::HtmlEscape](#)
The Flex lexer class for the main Tang language.

Macros

- #define **yyFlexLexer** TangHtmlEscapeFlexLexer
- #define **YY_DECL** std::string [Tang::HtmlEscape::get_next_token\(\)](#)

6.52.1 Detailed Description

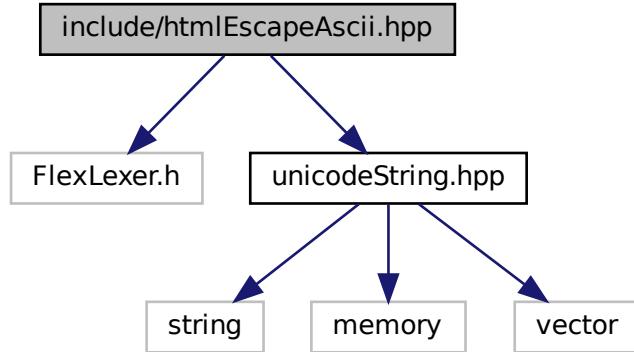
Declare the [Tang::HtmlEscape](#) used to tokenize a Tang script.

6.53 include/htmlEscapeAscii.hpp File Reference

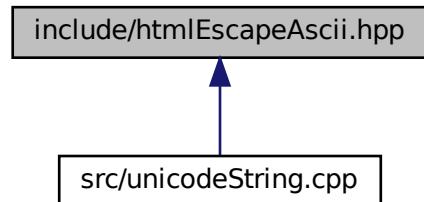
Declare the [Tang::HtmlEscapeAscii](#) used to tokenize a Tang script.

```
#include <FlexLexer.h>
#include "unicodeString.hpp"
```

Include dependency graph for htmlEscapeAscii.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::HtmlEscapeAscii](#)
The Flex lexer class for the main Tang language.

Macros

- `#define yyFlexLexer TangHtmlEscapeAsciiFlexLexer`
- `#define YY_DECL std::string Tang::HtmlEscapeAscii::get_next_token()`

6.53.1 Detailed Description

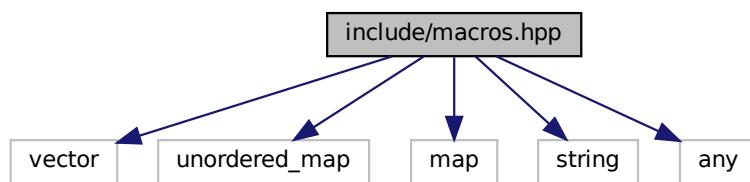
Declare the [Tang::HtmlEscapeAscii](#) used to tokenize a Tang script.

6.54 include/macros.hpp File Reference

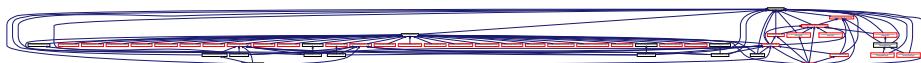
Contains generic macros.

```
#include <vector>
#include <unordered_map>
#include <map>
#include <string>
#include <any>
```

Include dependency graph for macros.hpp:



This graph shows which files directly or indirectly include this file:



Macros

- `#define TANGVERSION "0.0.0 alpha"`
- `#define OPCODE_FIND_INDEX(EXPRESSION, INDEX)`
- `#define UNARYOP(OPERAND, OP_S, OP_I)`
- `#define BINARYOP(LHS, RHS, OP_SS, OP_SI, OP_IS, OP_II)`

Typedefs

- using `Tang::integer_t` = `int32_t`
Define the size of signed integers used by Tang.
- using `Tang::uinteger_t` = `uint32_t`
Define the size of integers used by Tang.
- using `Tang::float_t` = `float`
Define the size of floats used by Tang.
- using `Tang::LibraryFunction` = `GarbageCollected(*)(Context &)`
A function pointer that will be executed.
- using `Tang::NativeFunction` = `GarbageCollected(*)(std::vector< GarbageCollected > &, Context &)`
A function pointer that will be executed as bound to an object.
- using `Tang::NativeBoundFunction` = `GarbageCollected(*)(GarbageCollected &, std::vector< GarbageCollected > &)`

- A function pointer that will be executed as bound to an object.*
- using `Tang::LibraryFunctionMap` = `std::map< std::string, LibraryFunction >`
A map of method names to LibraryFunction objects.
 - using `Tang::NativeBoundFunctionMap` = `std::map< std::string, std::pair< size_t, NativeBoundFunction > >`
A map of method names to NativeBoundFunction objects.
 - using `Tang::ContextData` = `std::unordered_map< std::string, std::any >`
Used to hold arbitrary data which should be made available to a program during the program execution.

6.54.1 Detailed Description

Contains generic macros.

6.54.2 Macro Definition Documentation

6.54.2.1 BINARYOP

```
#define BINARYOP (
    LHS,
    RHS,
    OP_SS,
    OP_SI,
    OP_IS,
    OP_II )
```

Value:

```
integer_t lhsIndex{-1}, rhsIndex{-1}; \
OPCODE_FIND_INDEX((LHS), lhsIndex); \
OPCODE_FIND_INDEX((RHS), rhsIndex); \
if (lhsIndex >= 0) { \
    if (rhsIndex >= 0) { \
        program.addBytecode((uinteger_t)Opcode:: OP_II); \
        program.addBytecode((uinteger_t)lhsIndex); \
        program.addBytecode((uinteger_t)rhsIndex); \
    } \
    else { \
        (RHS)->compile(program); \
        program.addBytecode((uinteger_t)Opcode:: OP_IS); \
        program.addBytecode((uinteger_t)lhsIndex); \
    } \
} \
else { \
    if (rhsIndex >= 0) { \
        (LHS)->compile(program); \
        program.addBytecode((uinteger_t)Opcode:: OP_SI); \
        program.addBytecode((uinteger_t)rhsIndex); \
    } \
    else { \
        (LHS)->compile(program); \
        (RHS)->compile(program); \
        program.addBytecode((uinteger_t)Opcode:: OP_SS); \
    } \
}
```

6.54.2.2 OPCODE_FIND_INDEX

```
#define OPCODE_FIND_INDEX(
    EXPRESSION,
    INDEX )
```

Value:

```
{ \
    auto & identifier = program.getIdentifiers(); \
    if (typeid(*EXPRESSION) == typeid(AstNodeIdentifier)) { \
        auto & name = static_cast<AstNodeIdentifier &>(*EXPRESSION).name; \
        if (identifier.count(name)) { \
            INDEX = identifier.at(name); \
        } \
    } \
    else if (typeid(*EXPRESSION) == typeid(AstNodeString)) { \
        auto & strings = program.getStrings(); \
        auto & stringConv = static_cast<AstNodeString &>(*EXPRESSION); \
        auto & val = stringConv.getVal(); \
        auto & type = stringConv.getType(); \
        if (strings.count({val, type})) { \
            INDEX = strings.at({val, type}) + program.getIdentifiers().size(); \
        } \
    } \
}
```

6.54.2.3 UNARYOP

```
#define UNARYOP(
    OPERAND,
    OP_S,
    OP_I )
```

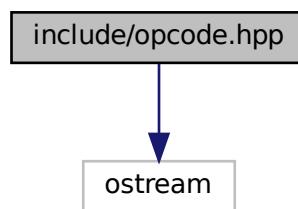
Value:

```
integer_t index{-1}; \
OPCODE_FIND_INDEX((OPERAND), index); \
if (index >= 0) { \
    program.addBytecode((uinteger_t)Opcode:: OP_I); \
    program.addBytecode((uinteger_t)index); \
} \
else { \
    (OPERAND)->compile(program); \
    program.addBytecode((uinteger_t)Opcode:: OP_S); \
}
```

6.55 include/opcode.hpp File Reference

Declare the OpCodes used in the Bytecode representation of a program.

```
#include <iostream>
Include dependency graph for opcode.hpp:
```



This graph shows which files directly or indirectly include this file:



Enumerations

- enum class `Tang::Opcode` {
 `POP` , `PEEK` , `POKE` , `COPY` ,
 `JMP` , `JMPF_S` , `JMPF_I` , `JMPF_POP` ,
 `JMPT_S` , `JMPT_I` , `JMPT_POP` , `NULLVAL` ,
 `INTEGER` , `FLOAT` , `BOOLEAN` , `STRING` ,
 `ARRAY` , `MAP` , `LIBRARY` , `LIBRARYSAVE` ,
 `LIBRARYCOPY` , `FUNCTION` , `ASSIGNINDEX` , `ADD_SS` ,
 `ADD_SI` , `ADD_IS` , `ADD_II` , `SUBTRACT_SS` ,
 `SUBTRACT_SI` , `SUBTRACT_IS` , `SUBTRACT_II` , `MULTIPLY_SS` ,
 `MULTIPLY_SI` , `MULTIPLY_IS` , `MULTIPLY_II` , `DIVIDE_SS` ,
 `DIVIDE_SI` , `DIVIDE_IS` , `DIVIDE_II` , `MODULO_SS` ,
 `MODULO_SI` , `MODULO_IS` , `MODULO_II` , `NEGATIVE_S` ,
 `NEGATIVE_I` , `NOT_S` , `NOT_I` , `LT_SS` ,
 `LT_SI` , `LT_IS` , `LT_II` , `LTE_SS` ,
 `LTE_SI` , `LTE_IS` , `LTE_II` , `GT_SS` ,
 `GT_SI` , `GT_IS` , `GT_II` , `GTE_SS` ,
 `GTE_SI` , `GTE_IS` , `GTE_II` , `EQ_SS` ,
 `EQ_SI` , `EQ_IS` , `EQ_II` , `NEQ_SS` ,
 `NEQ_SI` , `NEQ_IS` , `NEQ_II` , `PERIOD_SS` ,
 `PERIOD_SI` , `PERIOD_IS` , `PERIOD_II` , `INDEX_SS` ,
 `INDEX_SI` , `INDEX_IS` , `INDEX_II` , `SLICE` ,
 `GETITERATOR_SI` , `GETITERATOR_II` , `ITERATORNEXT_II` , `ISITERATOREND_I` ,
 `CASTINTEGER_S` , `CASTINTEGER_I` , `CASTFLOAT_S` , `CASTFLOAT_I` ,
 `CASTBOOLEAN_S` , `CASTBOOLEAN_I` , `CASTSTRING_S` , `CASTSTRING_I` ,
 `CALLFUNC` , `CALLFUNC_I` , `RETURN` , `PRINT_S` ,
 `PRINT_I` }

All possible Opcodes that may be used in the Bytecode.

Functions

- `std::ostream & Tang::operator<< (std::ostream &lhs, const Tang::Opcode &rhs)`
Helper to output the name of an opcode.

6.55.1 Detailed Description

Declare the Opcodes used in the Bytecode representation of a program.

6.55.2 Enumeration Type Documentation

6.55.2.1 Opcode

```
enum Tang::Opcode [strong]
```

All possible Opcodes that may be used in the Bytecode.

For S/I suffixed Opcodes, (S) indicates that a value will be popped from the stack, and (I) indicates that an index is provided in the bytecode, to be referenced from the frame pointer (fp) during execution.

The S/I order in the Opcode indicates the nature (stack or index) of the associated values. For example, ADD_SS will add a lhs + rhs. The lhs will have been pushed onto the stack first, followed by the rhs.

Enumerator

POP	Pop a val.
PEEK	Stack # (from fp): push val from stack #.
POKE	Stack # (from fp): Copy a val, store @ stack #.
COPY	Stack # (from fp): Deep copy val @ stack #, store @ stack #.
JMP	PC #: set pc to PC #.
JMPF_S	PC #: read val, if false, set pc to PC #.
JMPF_I	PC #: read val, if false, set pc to PC #.
JMPF_POP	PC #: pop val, if false, set pc to PC #.
JMPT_S	PC #: read val, if true, set pc to PC #.
JMPT_I	PC #: read val, if true, set pc to PC #.
JMPT_POP	PC #: pop val, if true, set pc to PC #.
NULLVAL	Push a null onto the stack.
INTEGER	Push an integer onto the stack.
FLOAT	Push a floating point number onto the stack.
BOOLEAN	Push a boolean onto the stack.
STRING	Get len, char string: push string.
ARRAY	Get len, pop len items, putting them into an array with the last array item popped first.
MAP	Get len, pop len value then key pairs, putting them into a map.
LIBRARY	Pop name, push Library identified by name.
LIBRARYSAVE	Get index, save top of stack to library[index].
LIBRARYCOPY	Get index, load from library[index].
FUNCTION	Get argc, PC#: push function(argc, PC #)
ASSIGNINDEX	Pop index, pop collection, pop value, push (collection[index] = value)
ADD_SS	Push lhs + rhs.
ADD_SI	Push lhs + rhs.
ADD_IS	Push lhs + rhs.
ADD_II	Push lhs + rhs.
SUBTRACT_SS	Push lhs - rhs.
SUBTRACT_SI	Push lhs - rhs.
SUBTRACT_IS	Push lhs - rhs.
SUBTRACT_II	Push lhs - rhs.
MULTIPLY_SS	Push lhs * rhs.
MULTIPLY_SI	Push lhs * rhs.
MULTIPLY_IS	Push lhs * rhs.
MULTIPLY_II	Push lhs * rhs.
DIVIDE_SS	Push lhs / rhs.
DIVIDE_SI	Push lhs / rhs.

Enumerator

DIVIDE_IS	Push lhs / rhs.
DIVIDE_II	Push lhs / rhs.
MODULO_SS	Push lhs % rhs.
MODULO_SI	Push lhs % rhs.
MODULO_IS	Push lhs % rhs.
MODULO_II	Push lhs % rhs.
NEGATIVE_S	Push negative val.
NEGATIVE_I	Push negative val.
NOT_S	Push logical not of val.
NOT_I	Push logical not of val.
LT_SS	Push lhs < rhs.
LT_SI	Push lhs < rhs.
LT_IS	Push lhs < rhs.
LT_II	Push lhs < rhs.
LTE_SS	Push lhs <= rhs.
LTE_SI	Push lhs <= rhs.
LTE_IS	Push lhs <= rhs.
LTE_II	Push lhs <= rhs.
GT_SS	Push lhs > rhs.
GT_SI	Push lhs > rhs.
GT_IS	Push lhs > rhs.
GT_II	Push lhs > rhs.
GTE_SS	Push lhs >= rhs.
GTE_SI	Push lhs >= rhs.
GTE_IS	Push lhs >= rhs.
GTE_II	Push lhs >= rhs.
EQ_SS	Push lhs == rhs.
EQ_SI	Push lhs == rhs.
EQ_IS	Push lhs == rhs.
EQ_II	Push lhs == rhs.
NEQ_SS	Push lhs != rhs.
NEQ_SI	Push lhs != rhs.
NEQ_IS	Push lhs != rhs.
NEQ_II	Push lhs != rhs.
PERIOD_SS	Push lhs.rhs.
PERIOD_SI	Push lhs.rhs.
PERIOD_IS	Push lhs.rhs.
PERIOD_II	Push lhs.rhs.
INDEX_SS	Push collection[index].
INDEX_SI	Push collection[index].
INDEX_IS	Push collection[index].
INDEX_II	Push collection[index].
SLICE	Pop skip, pop end, pop begin, pop collection, push collection[begin:end:skip].
GETITERATOR_SI	Save collection iterator to a stack index.
GETITERATOR_II	Save collection iterator to a stack index.
ITERATORNEXT \leftarrow _II	Use the iterator at supplied index to calculate the next value, then store at 2nd supplied stack index.

Enumerator

ISITERATOREND _← _I	Push bool(is val[at stack index] == iterator end)
CASTINTEGER_S	Typecast to int, push.
CASTINTEGER_I	Typecast to int, push.
CASTFLOAT_S	Typecast to float, push.
CASTFLOAT_I	Typecast to float, push.
CASTBOOLEAN_S	Typecast to boolean, push.
CASTBOOLEAN_I	Typecast to boolean, push.
CASTSTRING_S	Typecast to string, push.
CASTSTRING_I	Typecast to string, push.
CALLFUNC	Get argc, Pop a function, execute function if argc matches.
CALLFUNC_I	Get argc, get index, execute function at index if argc matches.
RETURN	Get stack #, pop return val, pop (stack #) times, push val, restore fp, restore pc.
PRINT_S	Pop val, print(val), push error or NULL.
PRINT_I	Pop val, print(val), push error or NULL.

6.55.3 Function Documentation**6.55.3.1 operator<<()**

```
ostream & Tang::operator<< (
    std::ostream & lhs,
    const Tang::Opcode & rhs )
```

Helper to output the name of an opcode.

Parameters

<i>lhs</i>	The ostream to write into.
<i>rhs</i>	The Opcode whose name should be output.

Returns

The ostream that was written to.

Here is the call graph for this function:

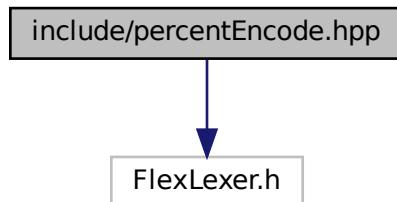


6.56 include/percentEncode.hpp File Reference

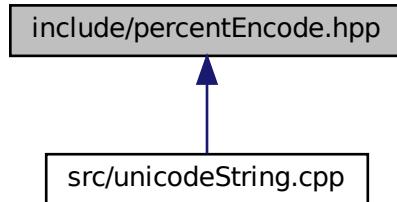
Declare the [Tang::PercentEncode](#) used to tokenize a Tang script.

```
#include <FlexLexer.h>
```

Include dependency graph for percentEncode.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class Tang::PercentEncode

The Flex lexer class for the Percent Encode scanner.

Macros

- `#define yyFlexLexer TangPercentEncodeFlexLexer`
 - `#define YY_DECL std::string Tang::PercentEncode::get_next_token()`

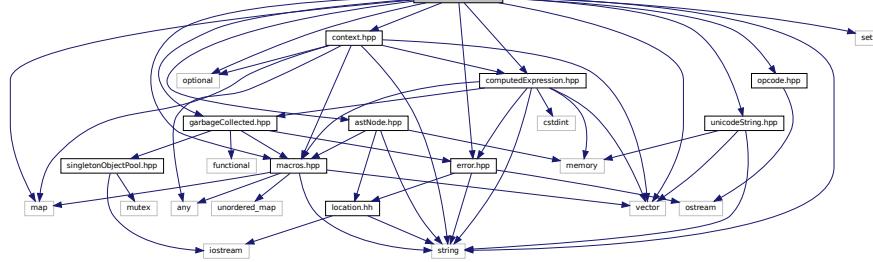
6.56.1 Detailed Description

Declare the `Tang::PercentEncode` used to tokenize a Tang script.

6.57 include/program.hpp File Reference

Declare the `Tang::Program` class used to compile and execute source code.

```
#include <map>
#include <optional>
#include <set>
#include <string>
#include <vector>
#include "astNode.hpp"
#include "computedExpression.hpp"
#include "context.hpp"
#include "error.hpp"
#include "garbageCollected.hpp"
#include "macros.hpp"
#include "opcode.hpp"
#include "unicodeString.hpp"
Include dependency graph for program.hpp:
```



This graph shows which files directly or indirectly include this file:

Classes

- class [Tang::Program](#)
Represents a compiled script or template that may be executed.

Typedefs

- using [Tang::Bytecode](#) = std::vector< [Tang::uinteger_t](#) >
Contains the Opcodes of a compiled program.
- using [Tang::OpcodeOffsets](#) = std::map< Opcode, std::vector< std::pair< size_t, size_t > >>
Map of Opcodes to a pair of offsets, with the first position being the Bytecode offset, and the second position being the position of the Opcode relative to the other Opcodes (e.g., the Nth position).
- using [Tang::OpcodePositions](#) = std::vector< std::pair< Opcode, size_t > >
Vector of Opcodes in positional order.
- using [Tang::OpcodeAnnotations](#) = std::map< size_t, std::string >
Map of Bytecode offsets to a string annotation.

6.57.1 Detailed Description

Declare the [Tang::Program](#) class used to compile and execute source code.

6.57.2 Typedef Documentation

6.57.2.1 OpcodePositions

```
using Tang::OpcodePositions = typedef std::vector<std::pair<Opcode, size_t> >
```

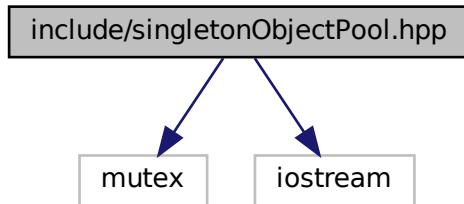
Vector of Opcodes in positional order.

Each entry is a pair, specifying the Opcode and the Bytecode offset.

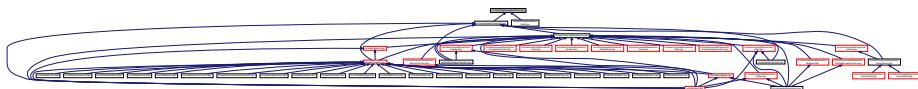
6.58 include/singletonObjectPool.hpp File Reference

Declare the [Tang::SingletonObjectPool](#) class.

```
#include <mutex>
#include <iostream>
Include dependency graph for singletonObjectPool.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::SingletonObjectPool< T >](#)
A thread-safe, singleton object pool of the designated type.

Macros

- [#define GROW 1024](#)
The threshold size to use when allocating blocks of data, measured in the number of instances of the object type.

6.58.1 Detailed Description

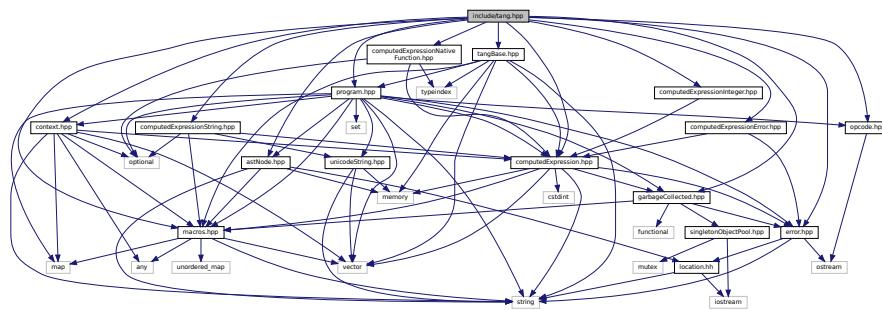
Declare the [Tang::SingletonObjectPool](#) class.

6.59 include/tang.hpp File Reference

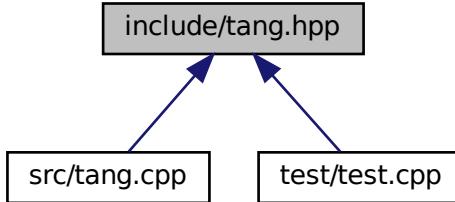
Header file supplied for use by 3rd party code so that they can easily include all necessary headers.

```
#include "macros.hpp"
#include "tangBase.hpp"
#include "astNode.hpp"
#include "error.hpp"
#include "garbageCollected.hpp"
```

```
#include "program.hpp"
#include "context.hpp"
#include "opcode.hpp"
#include "computedExpression.hpp"
#include "computedExpressionString.hpp"
#include "computedExpressionNativeFunction.hpp"
#include "computedExpressionInteger.hpp"
#include "computedExpressionError.hpp"
Include dependency graph for tang.hpp:
```



This graph shows which files directly or indirectly include this file:



6.59.1 Detailed Description

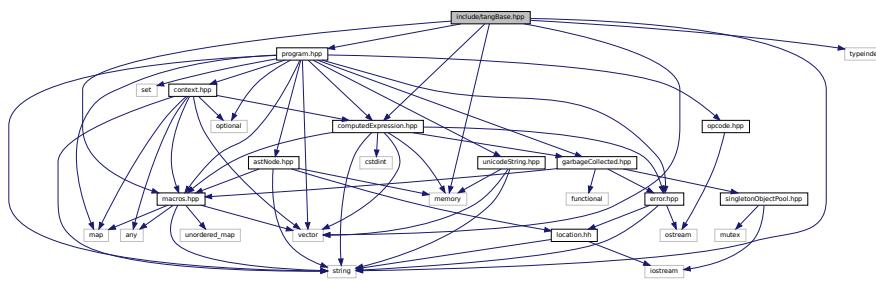
Header file supplied for use by 3rd party code so that they can easily include all necessary headers.

6.60 include/tangBase.hpp File Reference

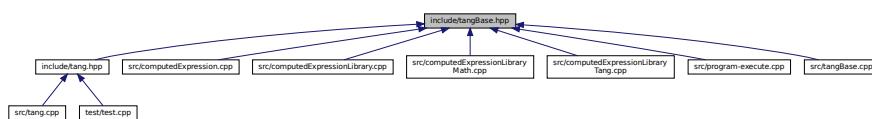
Declare the [Tang::TangBase](#) class used to interact with Tang.

```
#include <memory>
#include <string>
#include <typeindex>
#include <vector>
#include "macros.hpp"
```

```
#include "program.hpp"
#include "computedExpression.hpp"
Include dependency graph for tangBase.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::TangBase](#)
The base class for the Tang programming language.

6.60.1 Detailed Description

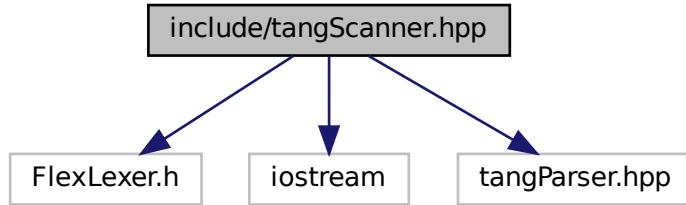
Declare the [Tang::TangBase](#) class used to interact with Tang.

6.61 include/tangScanner.hpp File Reference

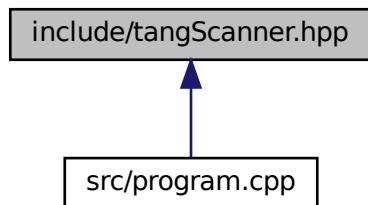
Declare the [Tang::TangScanner](#) used to tokenize a Tang script.

```
#include <FlexLexer.h>
#include <iostream>
```

```
#include "tangParser.hpp"
Include dependency graph for tangScanner.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::TangScanner](#)
The Flex lexer class for the main Tang language.

Macros

- #define [yyFlexLexer](#) TangTangFlexLexer
- #define [YY_DECL](#) Tang::TangParser::symbol_type [Tang::TangScanner::get_next_token\(\)](#)

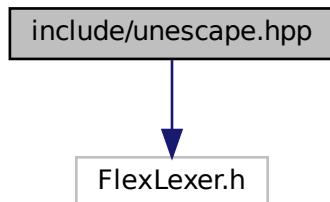
6.61.1 Detailed Description

Declare the [Tang::TangScanner](#) used to tokenize a Tang script.

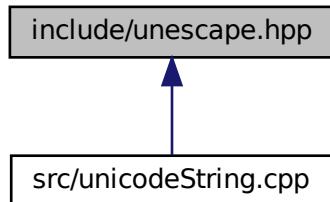
6.62 include/unescape.hpp File Reference

Declare the [Tang::Unescape](#) used to tokenize a Tang script.

```
#include <FlexLexer.h>
Include dependency graph for unescape.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::Unescape](#)
The Flex lexer class for the main Tang language.

Macros

- `#define yyFlexLexer TangUnescapeFlexLexer`
- `#define YY_DECL std::string Tang::Unescape::get_next_token()`

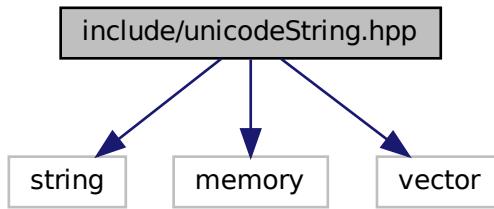
6.62.1 Detailed Description

Declare the [Tang::Unescape](#) used to tokenize a Tang script.

6.63 include/unicodeString.hpp File Reference

Contains the code to interface with the ICU library.

```
#include <string>
#include <memory>
#include <vector>
Include dependency graph for unicodeString.hpp:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Tang::UnicodeString](#)
Represents a UTF-8 encoded string that is Unicode-aware.

Functions

- std::string [Tang::unescape](#) (const std::string &str)
Return an "unescaped" version of the provided string, which, when interpreted by Tang, should result in a representation equivalent to the original source string.
- std::string [Tang::htmlEscape](#) (const std::string &str)
Return an "html escaped" version of the provided string.
- std::string [Tang::htmlEscapeAscii](#) (const std::string &str, [UnicodeString::Type](#) type=[UnicodeString::Type::Untrusted](#))
Return an Ascii-only, "html escaped" version of the provided string.
- std::string [Tang::percentEncode](#) (const std::string &str)
Return a "percent encoded" version of the provided string.

6.63.1 Detailed Description

Contains the code to interface with the ICU library.

6.63.2 Function Documentation

6.63.2.1 htmlEscape()

```
string Tang::htmlEscape (
    const std::string & str )
```

Return an "html escaped" version of the provided string.

Only "critical" characters <, >, &, ", and `` will be escaped. All other characters will be allowed through unaltered. The result is a UTF-8 encoded string that is safe for inclusion in an HTML template without disturbing the HTML structure.

Parameters

<code>str</code>	The string to be escaped.
------------------	---------------------------

Returns

An "escaped" version of the provided string.

Here is the call graph for this function:



6.63.2.2 htmlEscapeAscii()

```
string Tang::htmlEscapeAscii (
    const std::string & str,
    UnicodeString::Type type = UnicodeString::Type::Untrusted )
```

Return an Ascii-only, "html escaped" version of the provided string.

This function will convert all characters into an Ascii-only representation of the provided UTF-8 encoded string. Visible, standard Ascii characters will pass through unaltered, but all others will be replaced by their HTML escape sequence (if it exists), or the appropriate hexadecimal escape code.

Parameters

<i>str</i>	The string to be escaped.
------------	---------------------------

Returns

An "escaped" version of the provided string.

Here is the call graph for this function:



6.63.2.3 percentEncode()

```
std::string Tang::percentEncode (
    const std::string & str )
```

Return a "percent encoded" version of the provided string.

See <https://en.wikipedia.org/wiki/Percent-encoding> for details.

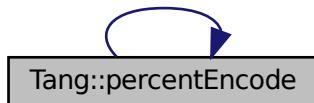
Parameters

<i>str</i>	The string to be escaped.
------------	---------------------------

Returns

A "percent encoded" version of the provided string.

Here is the call graph for this function:



6.63.2.4 unescape()

```
string Tang::unescape (
    const std::string & str )
```

Return an "unescaped" version of the provided string, which, when interpreted by Tang, should result in a representation equivalent to the original source string.

Parameters

<code>str</code>	The string to be unescaped.
------------------	-----------------------------

Returns

An "unescaped" version of the provided string.

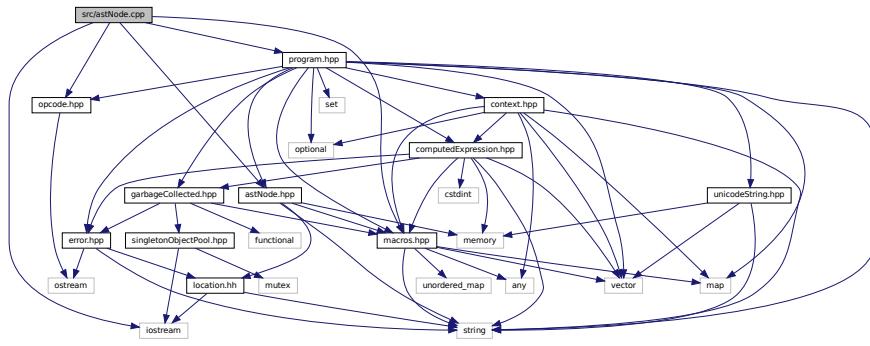
Here is the call graph for this function:



6.64 src/astNode.cpp File Reference

Define the [Tang::AstNode](#) class.

```
#include <iostream>
#include "macros.hpp"
#include "astNode.hpp"
#include "program.hpp"
#include "opcode.hpp"
Include dependency graph for astNode.cpp:
```



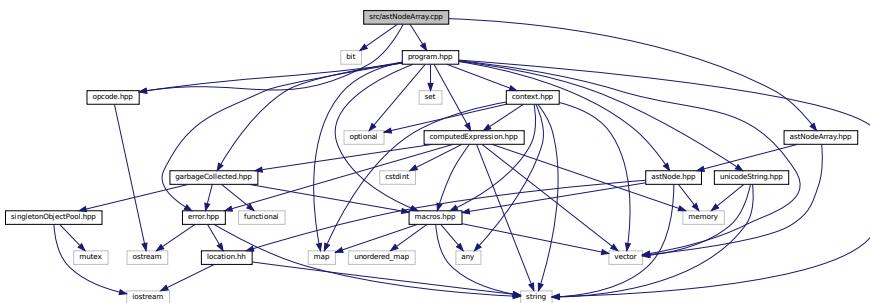
6.64.1 Detailed Description

Define the [Tang::AstNode](#) class.

6.65 src/astNodeArray.cpp File Reference

Define the [Tang::AstNodeArray](#) class.

```
#include <bit>
#include "astNodeArray.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeArray.cpp:
```



6.65.1 Detailed Description

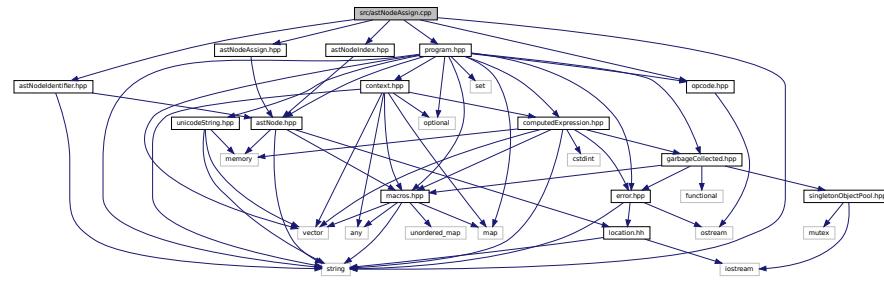
Define the [Tang::AstNodeArray](#) class.

6.66 src/astNodeAssign.cpp File Reference

Define the `Tang::AstNodeAssign` class.

```
#include <string>
#include "astNodeAssign.hpp"
#include "astNodeIdentifier.hpp"
#include "astNodeIndex.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeAssign.cpp
```

Include dependency graph for astNodeAssign.cpp:



6.66.1 Detailed Description

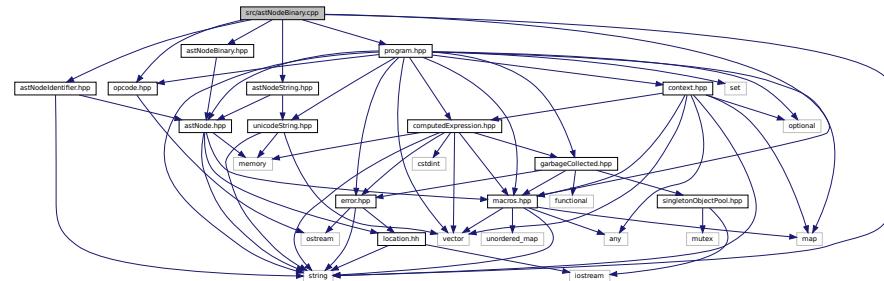
Define the `Tang::AstNodeAssign` class.

6.67 src/astNodeBinary.cpp File Reference

Define the `Tang::AstNodeBinary` class.

```
#include <string>
#include "astNodeBinary.hpp"
#include "astNodeIdentifier.hpp"
#include "astNodeString.hpp"
#include "macros.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeBinary.hpp:
```

Include dependency graph for astNodeBinary.cpp:



Macros

- #define LOGICALOP(OP_S, OP_I)

6.67.1 Detailed Description

Define the [Tang::AstNodeBinary](#) class.

6.67.2 Macro Definition Documentation

6.67.2.1 LOGICALOP

```
#define LOGICALOP( \
    OP_S, \
    OP_I )
```

Value:

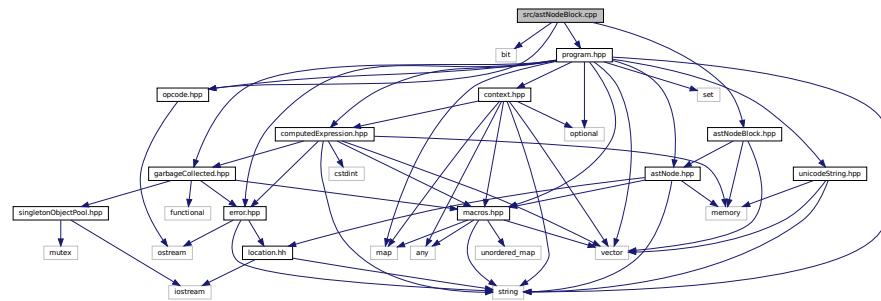
```
integer_t lhsIndex{-1}; \
OPCODE_FIND_INDEX(this->lhs, lhsIndex); \
size_t conditionJump{0}; \
if (lhsIndex >= 0) { \
    conditionJump = program.getBytecode().size(); \
    program.addBytecode((uinteger_t)Opcode:: OP_I); \
    program.addBytecode(lhsIndex); \
    program.addBytecode(0); \
    this->rhs->compile(program); \
    auto rhsLeapfrog = program.getBytecode().size(); \
    program.addBytecode((uinteger_t)Opcode::JMP); \
    program.addBytecode(0); \
    program.setJumpTarget(conditionJump, program.getBytecode().size()); \
    program.addBytecode((uinteger_t)Opcode::PEEK); \
    program.addBytecode(lhsIndex); \
    program.setJumpTarget(rhsLeapfrog, program.getBytecode().size()); \
} \
else { \
    this->lhs->compile(program); \
    conditionJump = program.getBytecode().size(); \
    program.addBytecode((uinteger_t)Opcode:: OP_S); \
    program.addBytecode(0); \
    program.addBytecode((uinteger_t)Opcode::POP); \
    this->rhs->compile(program); \
    program.setJumpTarget(conditionJump, program.getBytecode().size()); \
}
```

6.68 src/astNodeBlock.cpp File Reference

Define the [Tang::AstNodeBlock](#) class.

```
#include <bit>
#include "astNodeBlock.hpp"
#include "opcode.hpp"
```

```
#include "program.hpp"
Include dependency graph for astNodeBlock.cpp:
```



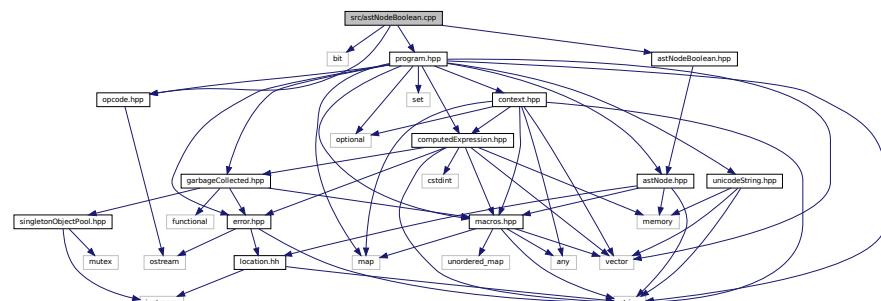
6.68.1 Detailed Description

Define the `Tang::AstNodeBlock` class.

6.69 src/astNodeBoolean.cpp File Reference

Define the `Tang::AstNodeBoolean` class.

```
#include <bit>
#include "astNodeBoolean.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeBoolean.cpp:
```



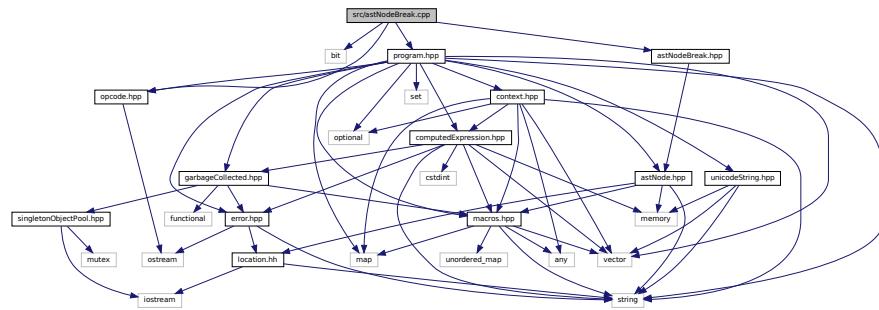
6.69.1 Detailed Description

Define the Tang::AstNodeBoolean class.

6.70 src/astNodeBreak.cpp File Reference

Define the `Tang::AstNodeBreak` class.

```
#include <bit>
#include "astNodeBreak.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeBreak.cpp:
```



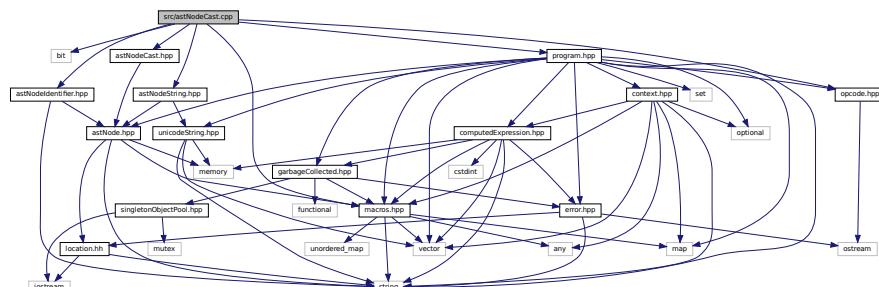
6.70.1 Detailed Description

Define the `Tang::AstNodeBreak` class.

6.71 src/astNodeCast.cpp File Reference

Define the `Tang::AstNodeCast` class.

```
#include <bit>
#include "astNodeCast.hpp"
#include "astNodeIdentifier.hpp"
#include "astNodeString.hpp"
#include "macros.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeCast.hpp:
```



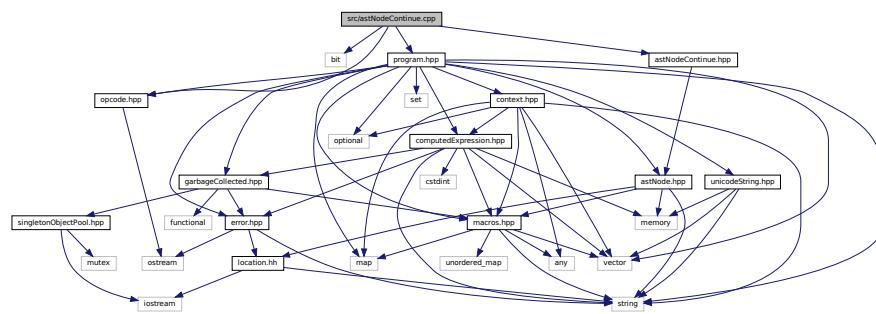
6.71.1 Detailed Description

Define the [Tang::AstNodeCast](#) class.

6.72 src/astNodeContinue.cpp File Reference

Define the [Tang::AstNodeContinue](#) class.

```
#include <bit>
#include "astNodeContinue.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeContinue.cpp:
```



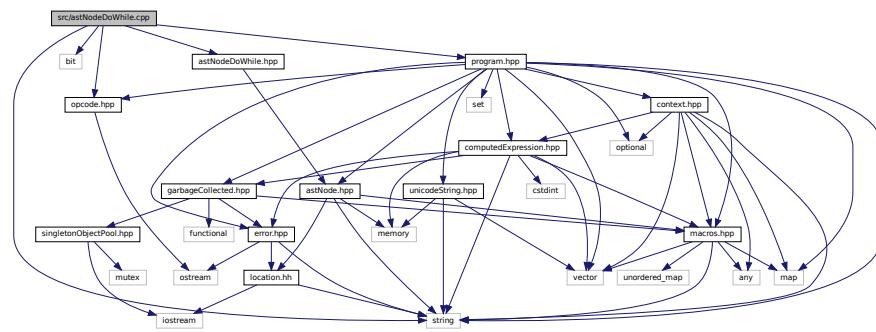
6.72.1 Detailed Description

Define the [Tang::AstNodeContinue](#) class.

6.73 src/astNodeDoWhile.cpp File Reference

Define the [Tang::AstNodeDoWhile](#) class.

```
#include <string>
#include <bit>
#include "astNodeDoWhile.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeDoWhile.cpp:
```



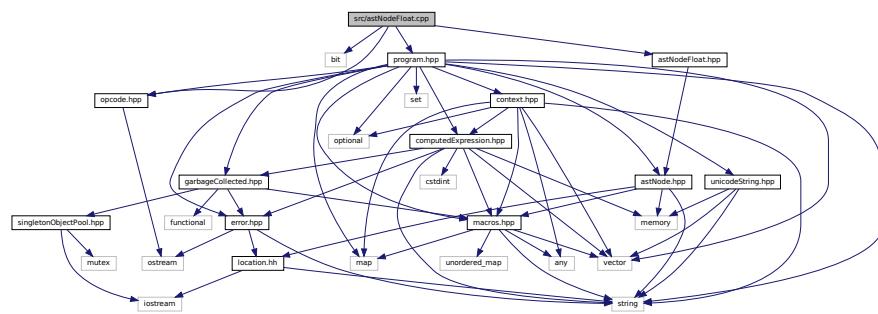
6.73.1 Detailed Description

Define the [Tang::AstNodeDoWhile](#) class.

6.74 src/astNodeFloat.cpp File Reference

Define the [Tang::AstNodeFloat](#) class.

```
#include <bit>
#include "astNodeFloat.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeFloat.cpp:
```



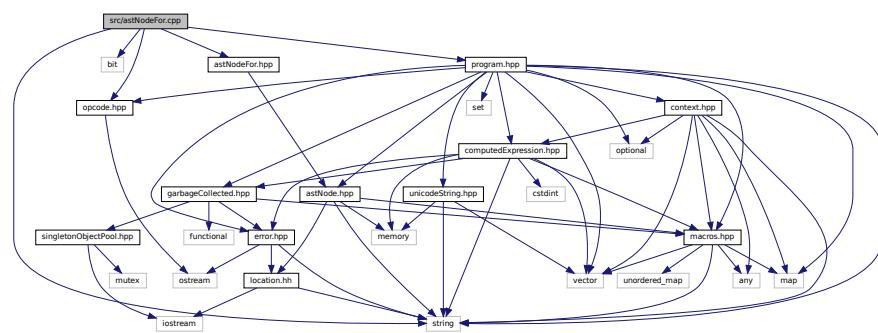
6.74.1 Detailed Description

Define the [Tang::AstNodeFloat](#) class.

6.75 src/astNodeFor.cpp File Reference

Define the [Tang::AstNodeFor](#) class.

```
#include <string>
#include <bit>
#include "astNodeFor.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeFor.cpp:
```



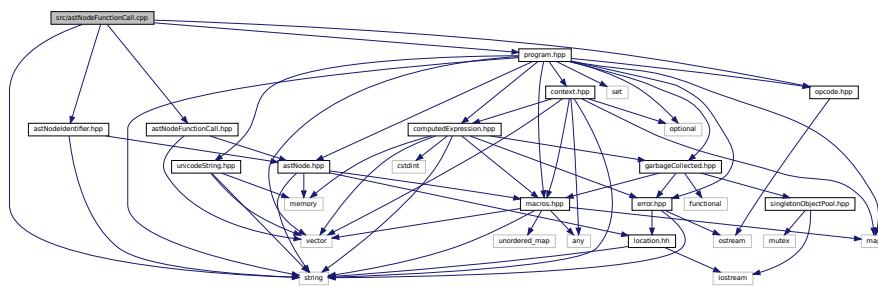
6.75.1 Detailed Description

Define the [Tang::AstNodeFor](#) class.

6.76 src/astNodeFunctionCall.cpp File Reference

Define the [Tang::AstNodeFunctionCall](#) class.

```
#include <string>
#include "astNodeIdentifier.hpp"
#include "astNodeFunctionCall.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeFunctionCall.cpp:
```



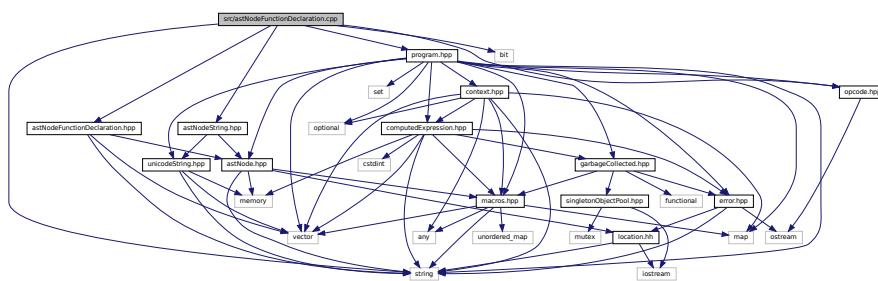
6.76.1 Detailed Description

Define the [Tang::AstNodeFunctionCall](#) class.

6.77 src/astNodeFunctionDeclaration.cpp File Reference

Define the [Tang::AstNodeFunctionDeclaration](#) class.

```
#include <string>
#include <bit>
#include "astNodeFunctionDeclaration.hpp"
#include "astNodeString.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeFunctionDeclaration.cpp:
```



6.77.1 Detailed Description

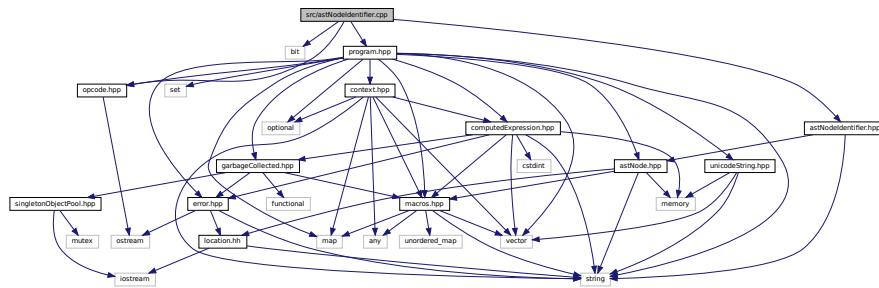
Define the `Tang::AstNodeFunctionDeclaration` class.

6.78 src/astNodeldentifier.cpp File Reference

Define the `Tang::AstNodeIdentifier` class.

```
#include <bit>
#include "astNodeIdentifier.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeIdentifier.cpp:
```

Include dependency graph for astNodIdentifier.cpp:



6.78.1 Detailed Description

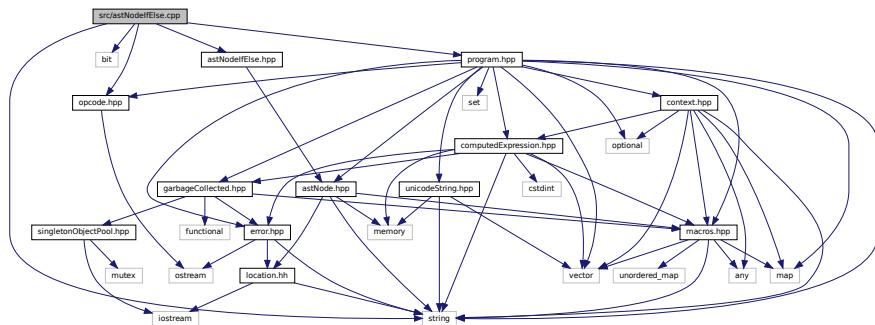
Define the `Tang::AstNodeIdentifier` class.

6.79 src/astNodeIfElse.cpp File Reference

Define the `Tang::AstNodeIfElse` class.

```
#include <string>
#include <bit>
#include "astNodeIfElse.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeIfElse.cpp:
```

Include dependency graph for astNodeIfElse.cpp:



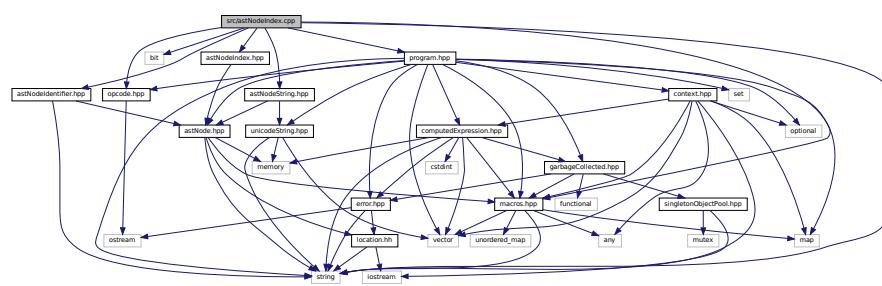
6.79.1 Detailed Description

Define the [Tang::AstNodeIfElse](#) class.

6.80 src/astNodeIndex.cpp File Reference

Define the [Tang::AstNodeIndex](#) class.

```
#include <string>
#include <bit>
#include "astNodeIdentifier.hpp"
#include "astNodeIndex.hpp"
#include "astNodeString.hpp"
#include "macros.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeIndex.cpp:
```



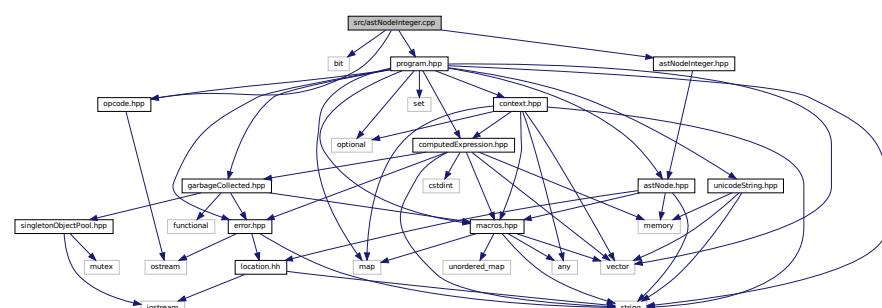
6.80.1 Detailed Description

Define the [Tang::AstNodeIndex](#) class.

6.81 src/astNodeInteger.cpp File Reference

Define the [Tang::AstNodeInteger](#) class.

```
#include <bit>
#include "astNodeInteger.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeInteger.cpp:
```



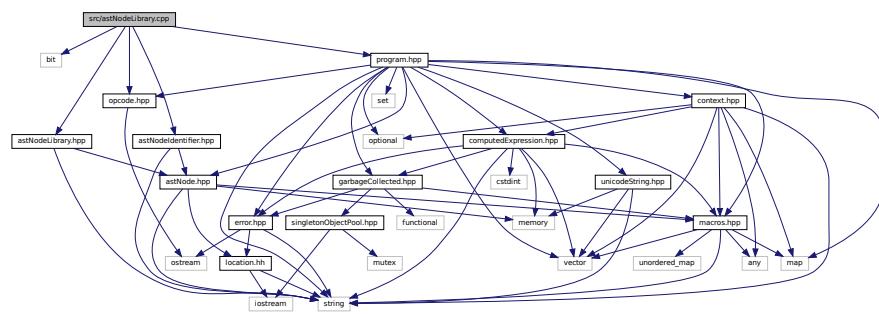
6.81.1 Detailed Description

Define the [Tang::AstNodeInteger](#) class.

6.82 src/astNodeLibrary.cpp File Reference

Define the [Tang::AstNodeLibrary](#) class.

```
#include <bit>
#include "opcode.hpp"
#include "astNodeLibrary.hpp"
#include "astNodeIdentifier.hpp"
#include "program.hpp"
Include dependency graph for astNodeLibrary.cpp:
```



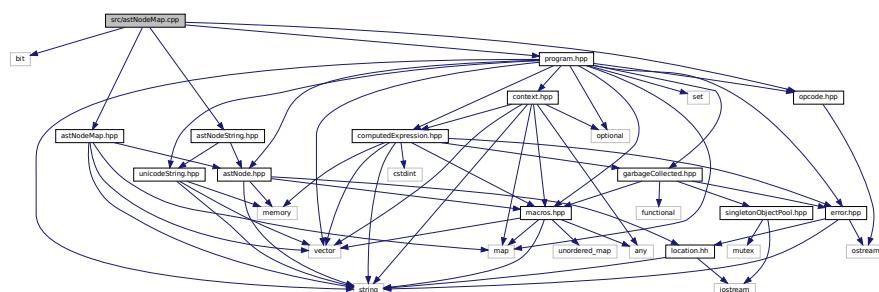
6.82.1 Detailed Description

Define the [Tang::AstNodeLibrary](#) class.

6.83 src/astNodeMap.cpp File Reference

Define the [Tang::AstNodeMap](#) class.

```
#include <bit>
#include "astNodeMap.hpp"
#include "astNodeString.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeMap.cpp:
```



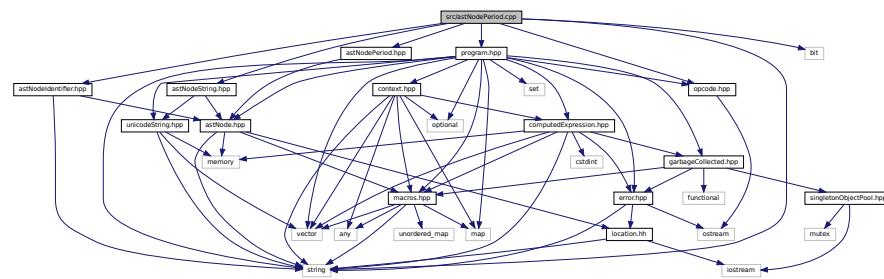
6.83.1 Detailed Description

Define the [Tang::AstNodeMap](#) class.

6.84 src/astNodePeriod.cpp File Reference

Define the [Tang::AstNodePeriod](#) class.

```
#include <string>
#include <bit>
#include "astNodeIdentifier.hpp"
#include "astNodePeriod.hpp"
#include "astNodeString.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodePeriod.cpp:
```



6.84.1 Detailed Description

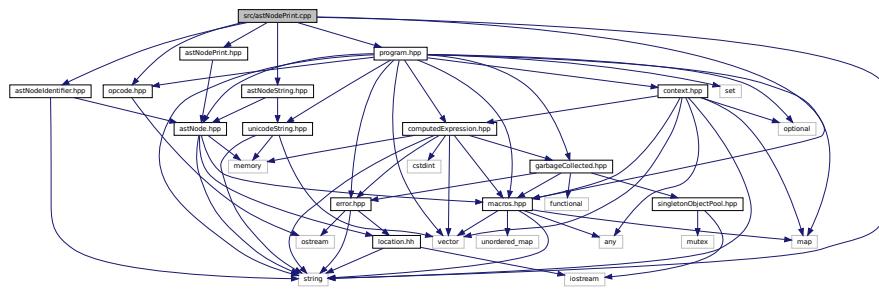
Define the [Tang::AstNodePeriod](#) class.

6.85 src/astNodePrint.cpp File Reference

Define the [Tang::AstNodePrint](#) class.

```
#include <string>
#include "astNodeIdentifier.hpp"
#include "astNodePrint.hpp"
#include "astNodeString.hpp"
#include "macros.hpp"
#include "opcode.hpp"
```

```
#include "program.hpp"
Include dependency graph for astNodePrint.cpp:
```



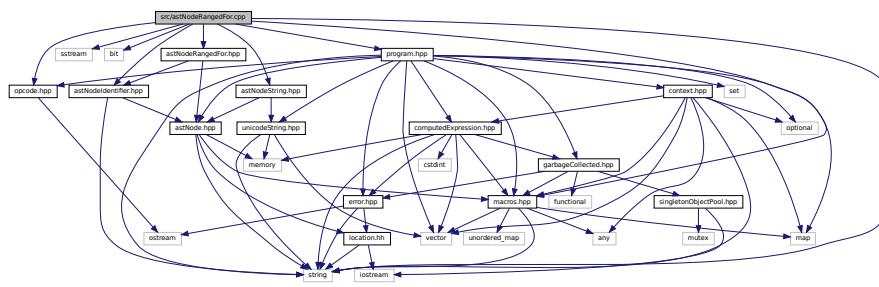
6.85.1 Detailed Description

Define the [Tang::AstNodePrint](#) class.

6.86 src/astNodeRangedFor.cpp File Reference

Define the [Tang::AstNodeRangedFor](#) class.

```
#include <string>
#include <sstream>
#include <bit>
#include "astNodeIdentifier.hpp"
#include "astNodeRangedFor.hpp"
#include "astNodeString.hpp"
#include "macros.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeRangedFor.cpp:
```



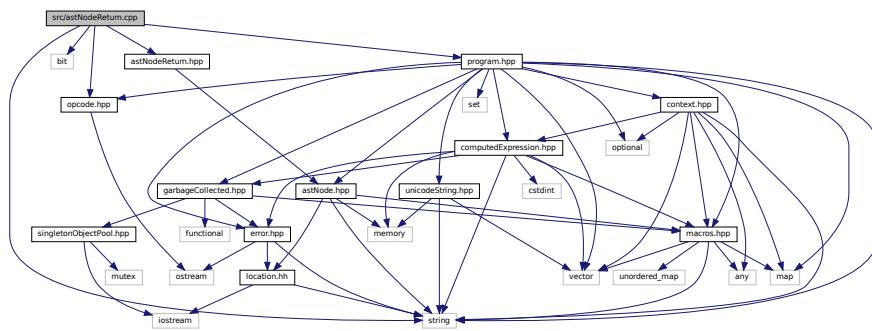
6.86.1 Detailed Description

Define the [Tang::AstNodeRangedFor](#) class.

6.87 src/astNodeReturn.cpp File Reference

Define the [Tang::AstNodeReturn](#) class.

```
#include <string>
#include <bit>
#include "astNodeReturn.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeReturn.cpp:
```



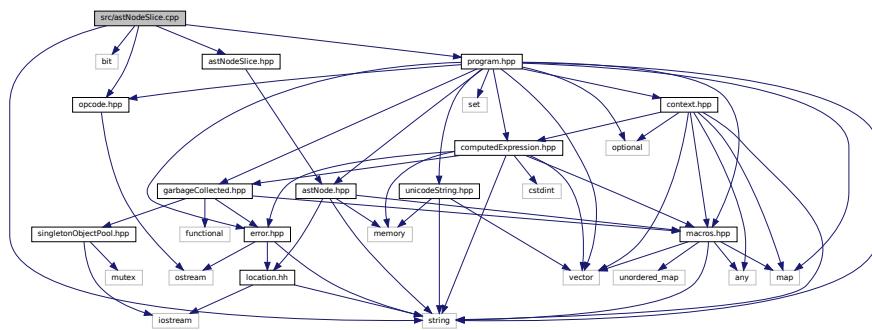
6.87.1 Detailed Description

Define the [Tang::AstNodeReturn](#) class.

6.88 src/astNodeSlice.cpp File Reference

Define the [Tang::AstNodeSlice](#) class.

```
#include <string>
#include <bit>
#include "astNodeSlice.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeSlice.cpp:
```



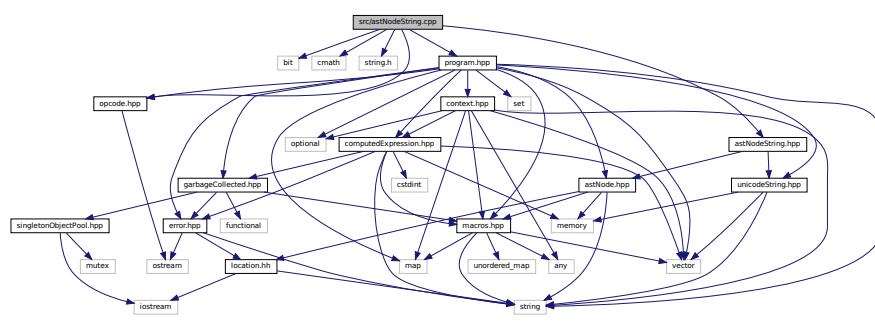
6.88.1 Detailed Description

Define the [Tang::AstNodeSlice](#) class.

6.89 src/astNodeString.cpp File Reference

Define the [Tang::AstNodeString](#) class.

```
#include <bit>
#include <cmath>
#include <string.h>
#include "astNodeString.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeString.cpp:
```



6.89.1 Detailed Description

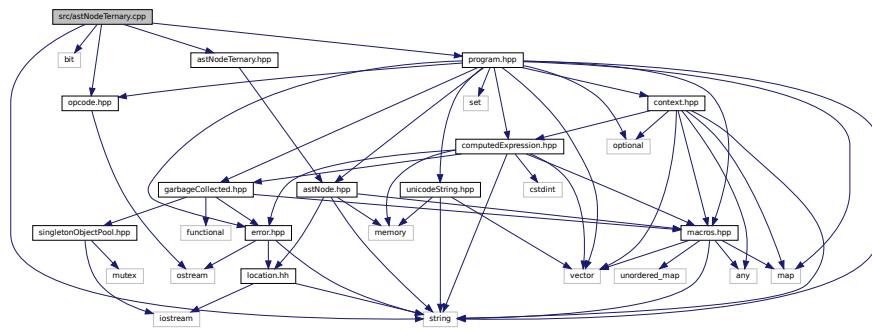
Define the [Tang::AstNodeString](#) class.

6.90 src/astNodeTernary.cpp File Reference

Define the [Tang::AstNodeTernary](#) class.

```
#include <string>
#include <bit>
#include "astNodeTernary.hpp"
#include "opcode.hpp"
```

```
#include "program.hpp"
Include dependency graph for astNodeTernary.cpp:
```



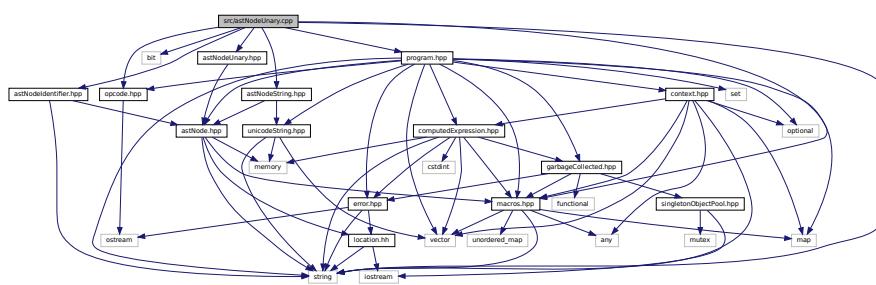
6.90.1 Detailed Description

Define the [Tang::AstNodeTernary](#) class.

6.91 src/astNodeUnary.cpp File Reference

Define the [Tang::AstNodeUnary](#) class.

```
#include <string>
#include <bit>
#include "astNodeIdentifier.hpp"
#include "astNodeString.hpp"
#include "astNodeUnary.hpp"
#include "macros.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeUnary.cpp:
```



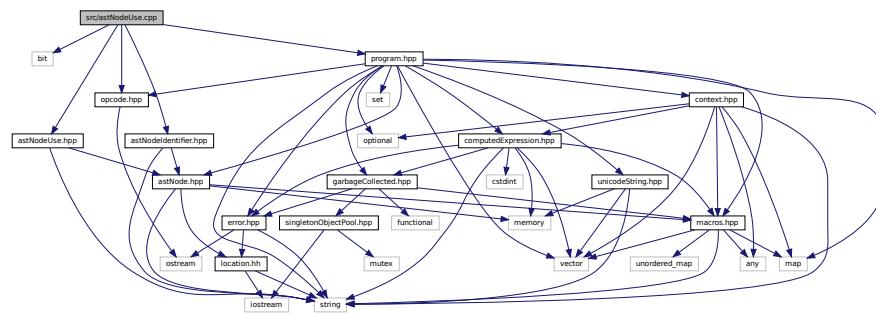
6.91.1 Detailed Description

Define the [Tang::AstNodeUnary](#) class.

6.92 src/astNodeUse.cpp File Reference

Define the [Tang::AstNodeUse](#) class.

```
#include <bit>
#include "opcode.hpp"
#include "astNodeUse.hpp"
#include "astNodeIdentifier.hpp"
#include "program.hpp"
Include dependency graph for astNodeUse.cpp:
```



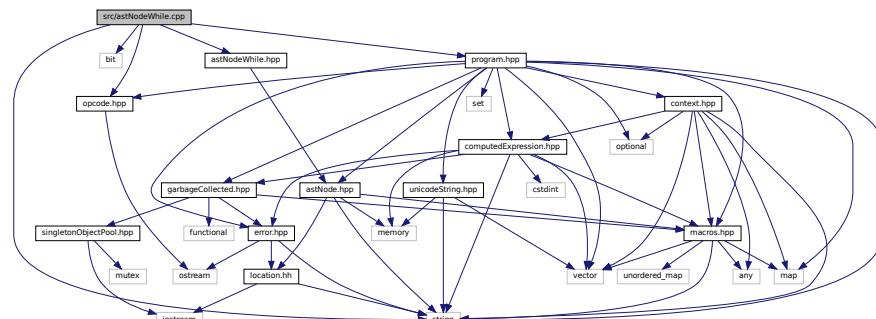
6.92.1 Detailed Description

Define the [Tang::AstNodeUse](#) class.

6.93 src/astNodeWhile.cpp File Reference

Define the [Tang::AstNodeWhile](#) class.

```
#include <string>
#include <bit>
#include "astNodeWhile.hpp"
#include "opcode.hpp"
#include "program.hpp"
Include dependency graph for astNodeWhile.cpp:
```



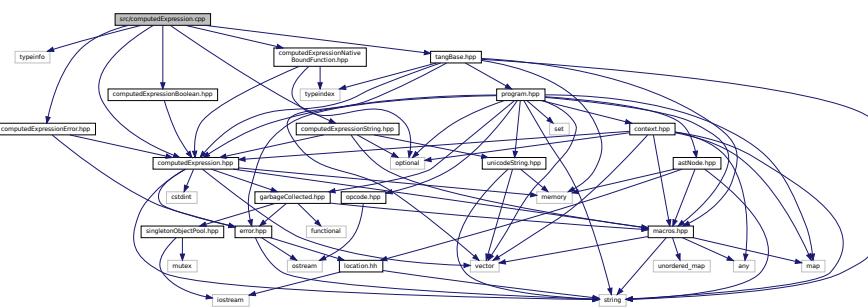
6.93.1 Detailed Description

Define the `Tang::AstNodeWhile` class.

6.94 src/computedExpression.cpp File Reference

Define the Tang::ComputedExpression class.

```
#include <typeinfo>
#include "computedExpression.hpp"
#include "computedExpressionBoolean.hpp"
#include "computedExpressionString.hpp"
#include "computedExpressionNativeBoundFunction.hpp"
#include "computedExpressionError.hpp"
#include "tangBase.hpp"
Include dependency graph for computedExpression.cpp:
```



6.94.1 Detailed Description

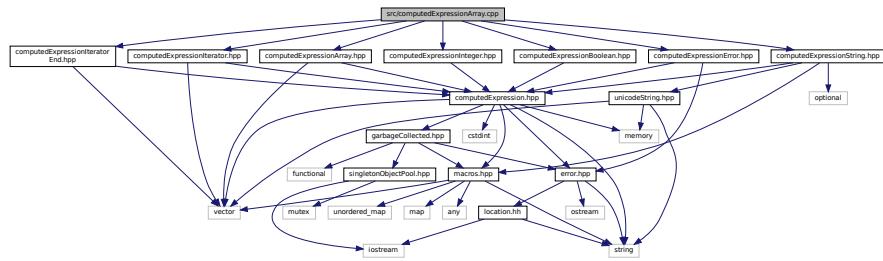
Define the `Tang::ComputedExpression` class.

6.95 src/computedExpressionArray.cpp File Reference

Define the [Tang::ComputedExpressionArray](#) class.

```
#include "computedExpressionArray.hpp"
#include "computedExpressionInteger.hpp"
#include "computedExpressionBoolean.hpp"
#include "computedExpressionString.hpp"
#include "computedExpressionIterator.hpp"
#include "computedExpressionIteratorEnd.hpp"
```

```
#include "computedExpressionError.hpp"
Include dependency graph for computedExpressionArray.cpp:
```



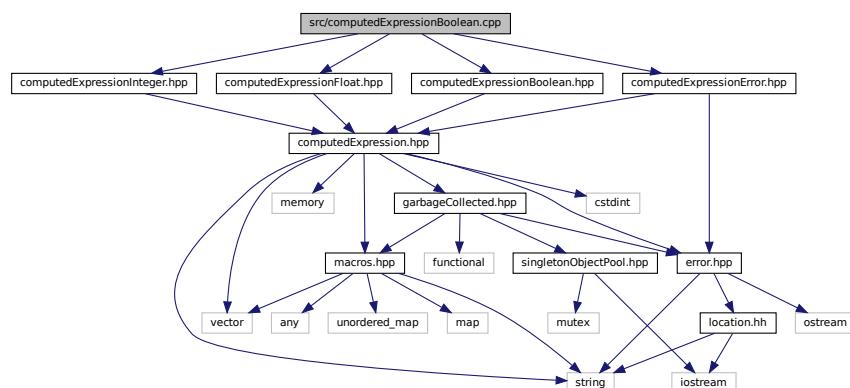
6.95.1 Detailed Description

Define the [Tang::ComputedExpressionArray](#) class.

6.96 src/computedExpressionBoolean.cpp File Reference

Define the [Tang::ComputedExpressionBoolean](#) class.

```
#include "computedExpressionBoolean.hpp"
#include "computedExpressionInteger.hpp"
#include "computedExpressionFloat.hpp"
#include "computedExpressionError.hpp"
Include dependency graph for computedExpressionBoolean.cpp:
```



6.96.1 Detailed Description

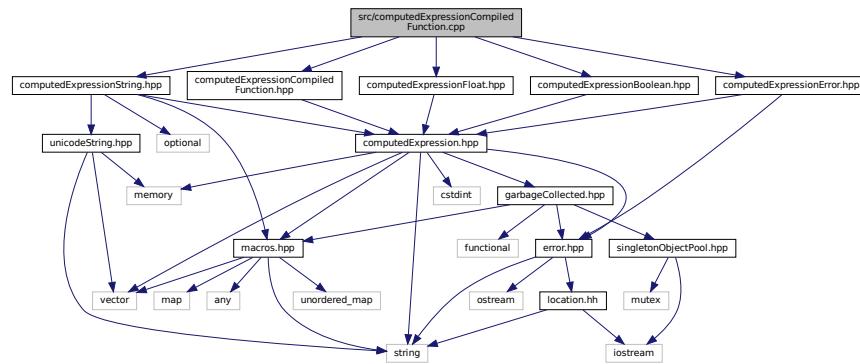
Define the [Tang::ComputedExpressionBoolean](#) class.

6.97 src/computedExpressionCompiledFunction.cpp File Reference

Define the [Tang::ComputedExpressionCompiledFunction](#) class.

```
#include "computedExpressionCompiledFunction.hpp"
#include "computedExpressionFloat.hpp"
#include "computedExpressionBoolean.hpp"
#include "computedExpressionString.hpp"
#include "computedExpressionError.hpp"
```

Include dependency graph for `computedExpressionCompiledFunction.cpp`:



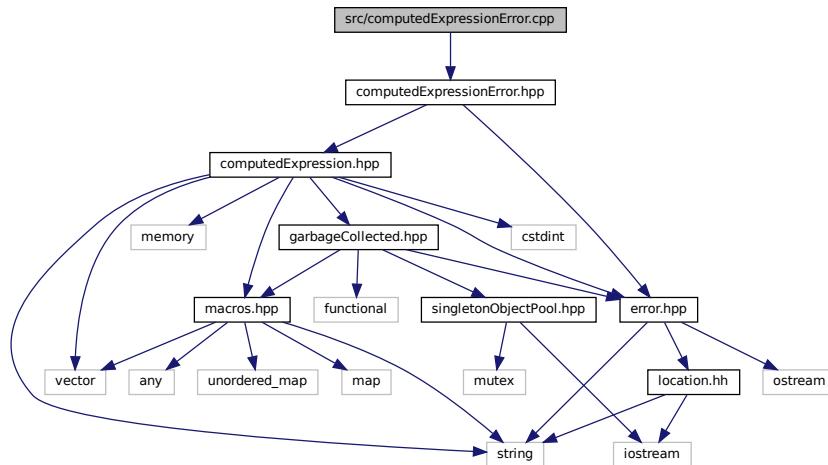
6.97.1 Detailed Description

Define the [Tang::ComputedExpressionCompiledFunction](#) class.

6.98 src/computedExpressionError.cpp File Reference

Define the [Tang::ComputedExpressionError](#) class.

```
#include "computedExpressionError.hpp"
Include dependency graph for computedExpressionError.cpp:
```



6.98.1 Detailed Description

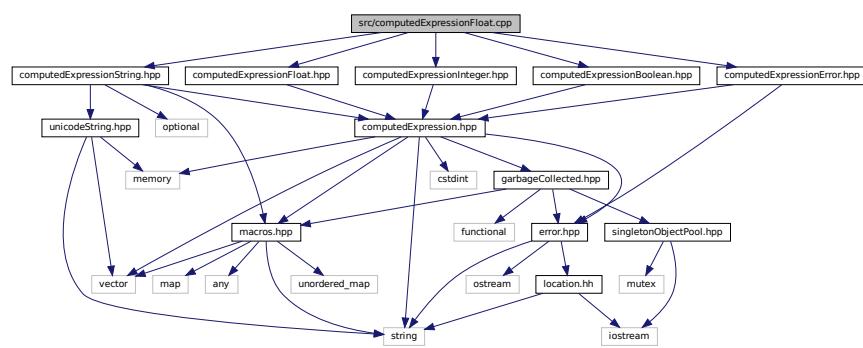
Define the [Tang::ComputedExpressionError](#) class.

6.99 src/computedExpressionFloat.cpp File Reference

Define the [Tang::ComputedExpressionFloat](#) class.

```
#include "computedExpressionFloat.hpp"
#include "computedExpressionInteger.hpp"
#include "computedExpressionBoolean.hpp"
#include "computedExpressionString.hpp"
#include "computedExpressionError.hpp"
```

Include dependency graph for computedExpressionFloat.cpp:



6.99.1 Detailed Description

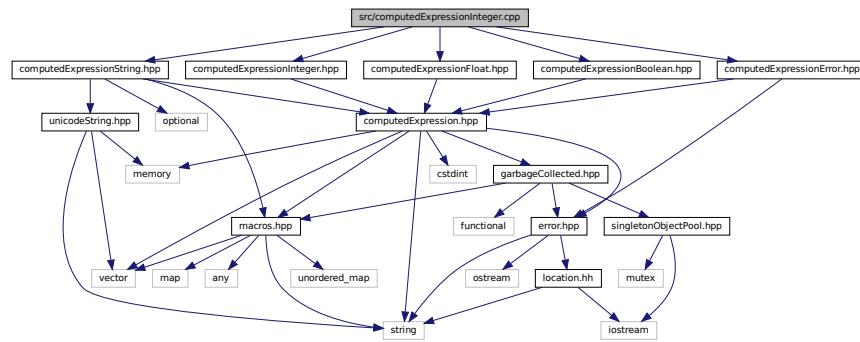
Define the [Tang::ComputedExpressionFloat](#) class.

6.100 src/computedExpressionInteger.cpp File Reference

Define the [Tang::ComputedExpressionInteger](#) class.

```
#include "computedExpressionInteger.hpp"
#include "computedExpressionFloat.hpp"
#include "computedExpressionBoolean.hpp"
#include "computedExpressionString.hpp"
```

```
#include "computedExpressionError.hpp"
Include dependency graph for computedExpressionInteger.cpp:
```



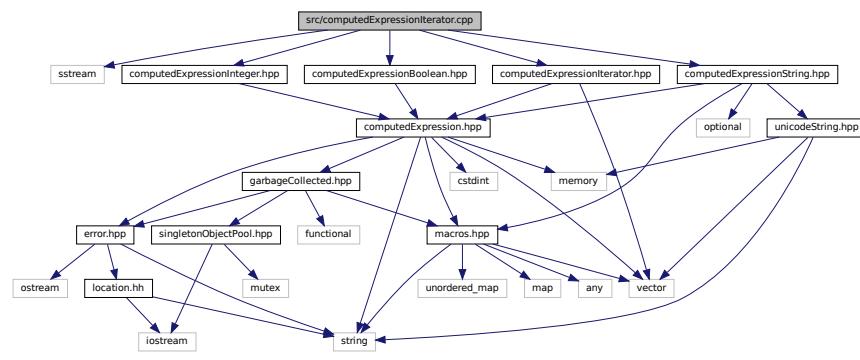
6.100.1 Detailed Description

Define the [Tang::ComputedExpressionInteger](#) class.

6.101 src/computedExpressionIterator.cpp File Reference

Define the [Tang::ComputedExpressionIterator](#) class.

```
#include <sstream>
#include "computedExpressionIterator.hpp"
#include "computedExpressionInteger.hpp"
#include "computedExpressionBoolean.hpp"
#include "computedExpressionString.hpp"
Include dependency graph for computedExpressionIterator.cpp:
```



6.101.1 Detailed Description

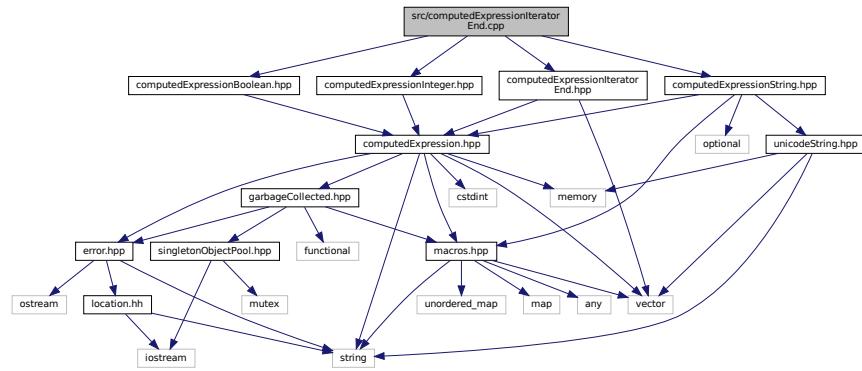
Define the [Tang::ComputedExpressionIterator](#) class.

6.102 src/computedExpressionIteratorEnd.cpp File Reference

Define the `Tang::ComputedExpressionIteratorEnd` class.

```
#include "computedExpressionIteratorEnd.hpp"
#include "computedExpressionInteger.hpp"
#include "computedExpressionBoolean.hpp"
#include "computedExpressionString.hpp"
Include dependency graph for computedExpressionIteratorEnd.cpp
```

Include dependency graph for computedExpressionIteratorEnd.cpp:



6.102.1 Detailed Description

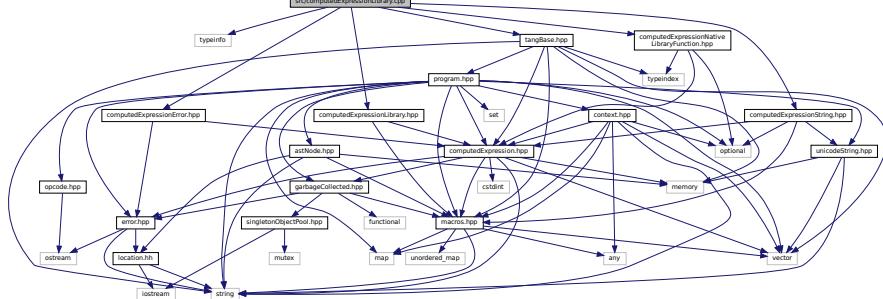
Define the `Tang::ComputedExpressionIteratorEnd` class.

6.103 src/computedExpressionLibrary.cpp File Reference

Define the `Tang::ComputedExpressionLibrary` class.

```
#include <typeinfo>
#include "tangBase.hpp"
#include "computedExpressionError.hpp"
#include "computedExpressionLibrary.hpp"
#include "computedExpressionNativeLibraryFunction.hpp"
#include "computedExpressionString.hpp"
Include dependency graph for computedExpressionLibrary.cpp:
```

include dependency graph for compiledExpressionLibrary.cpp.



6.103.1 Detailed Description

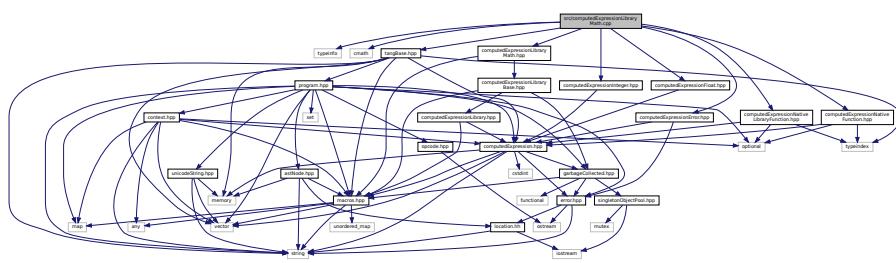
Define the [Tang::ComputedExpressionLibrary](#) class.

6.104 src/computedExpressionLibraryMath.cpp File Reference

Define the Tang::ComputedExpressionLibraryMath class.

```
#include <typeinfo>
#include <cmath>
#include "tangBase.hpp"
#include "computedExpressionError.hpp"
#include "computedExpressionLibraryMath.hpp"
#include "computedExpressionNativeLibraryFunction.hpp"
#include "computedExpressionNativeFunction.hpp"
#include "computedExpressionInteger.hpp"
#include "computedExpressionFloat.hpp"
```

Include dependency graph for computedExpressionLibraryMath.hpp:



6.104.1 Detailed Description

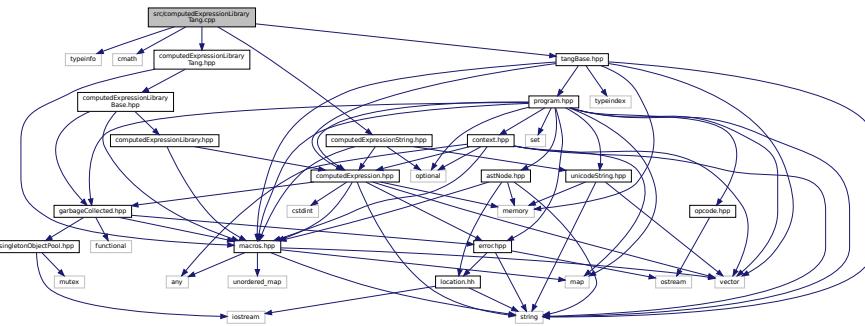
Define the Tang::ComputedExpressionLibraryMath class.

6.105 src/computedExpressionLibraryTang.cpp File Reference

Define the Tang::ComputedExpressionLibraryTang class.

```
#include <typeinfo>
#include <cmath>
#include "tangBase.hpp"
#include "computedExpressionLibraryTang.hpp"
```

```
#include "computedExpressionString.hpp"
Include dependency graph for computedExpressionLibraryTang.cpp:
```



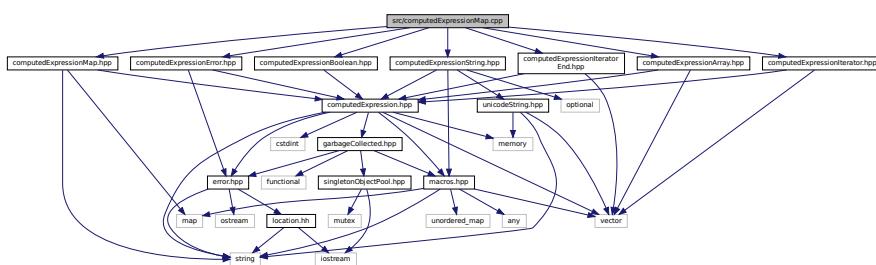
6.105.1 Detailed Description

Define the `Tang::ComputedExpressionLibraryTang` class.

6.106 src/computedExpressionMap.cpp File Reference

Define the [Tang::ComputedExpressionMap](#) class.

```
#include "computedExpressionMap.hpp"
#include "computedExpressionArray.hpp"
#include "computedExpressionBoolean.hpp"
#include "computedExpressionString.hpp"
#include "computedExpressionIterator.hpp"
#include "computedExpressionIteratorEnd.hpp"
#include "computedExpressionError.hpp"
Include dependency graph for computedExpressionMap.cpp:
```



6.106.1 Detailed Description

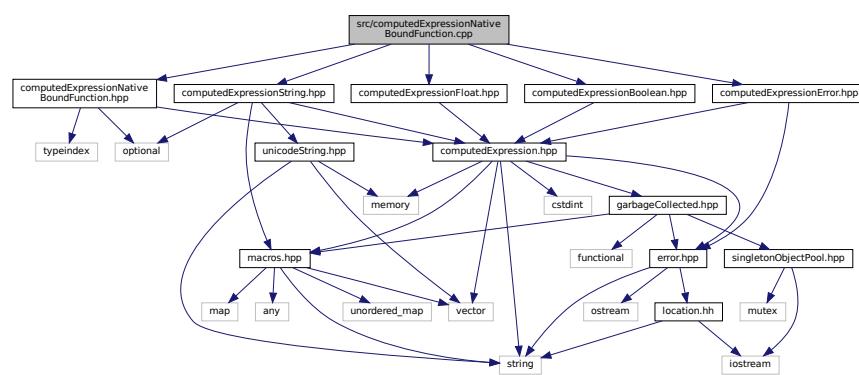
Define the `Tang::ComputedExpressionMap` class.

6.107 src/computedExpressionNativeBoundFunction.cpp File Reference

Define the [Tang::ComputedExpressionNativeBoundFunction](#) class.

```
#include "computedExpressionNativeBoundFunction.hpp"
#include "computedExpressionFloat.hpp"
#include "computedExpressionBoolean.hpp"
#include "computedExpressionString.hpp"
#include "computedExpressionError.hpp"
```

Include dependency graph for `computedExpressionNativeBoundFunction.cpp`:



6.107.1 Detailed Description

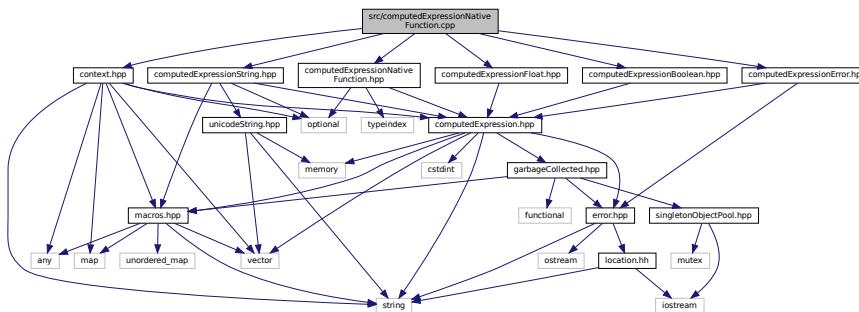
Define the [Tang::ComputedExpressionNativeBoundFunction](#) class.

6.108 src/computedExpressionNativeFunction.cpp File Reference

Define the [Tang::ComputedExpressionNativeFunction](#) class.

```
#include "context.hpp"
#include "computedExpressionNativeFunction.hpp"
#include "computedExpressionFloat.hpp"
#include "computedExpressionBoolean.hpp"
#include "computedExpressionString.hpp"
#include "computedExpressionError.hpp"
```

Include dependency graph for `computedExpressionNativeFunction.cpp`:



6.108.1 Detailed Description

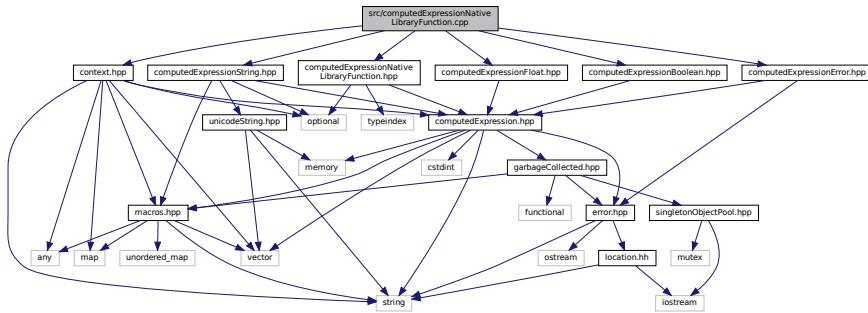
Define the [Tang::ComputedExpressionNativeLibraryFunction](#) class.

6.109 src/computedExpressionNativeLibraryFunction.cpp File Reference

Define the [Tang::ComputedExpressionNativeLibraryFunction](#) class.

```
#include "context.hpp"
#include "computedExpressionNativeLibraryFunction.hpp"
#include "computedExpressionFloat.hpp"
#include "computedExpressionBoolean.hpp"
#include "computedExpressionString.hpp"
#include "computedExpressionError.hpp"
```

Include dependency graph for computedExpressionNativeLibraryFunction.cpp:



6.109.1 Detailed Description

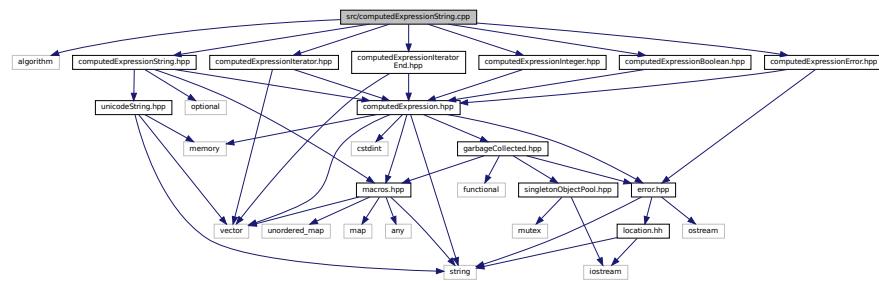
Define the [Tang::ComputedExpressionNativeLibraryFunction](#) class.

6.110 src/computedExpressionString.cpp File Reference

Define the [Tang::ComputedExpressionString](#) class.

```
#include <algorithm>
#include "computedExpressionString.hpp"
#include "computedExpressionBoolean.hpp"
#include "computedExpressionError.hpp"
#include "computedExpressionInteger.hpp"
#include "computedExpressionIterator.hpp"
```

```
#include "computedExpressionIteratorEnd.hpp"
Include dependency graph for computedExpressionString.cpp:
```



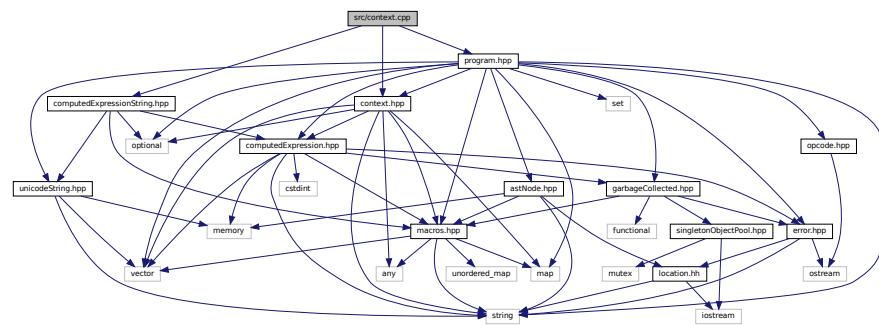
6.110.1 Detailed Description

Define the [Tang::ComputedExpressionString](#) class.

6.111 src/context.cpp File Reference

Define the [Tang::Context](#) class.

```
#include "context.hpp"
#include "program.hpp"
#include "computedExpressionString.hpp"
Include dependency graph for context.cpp:
```



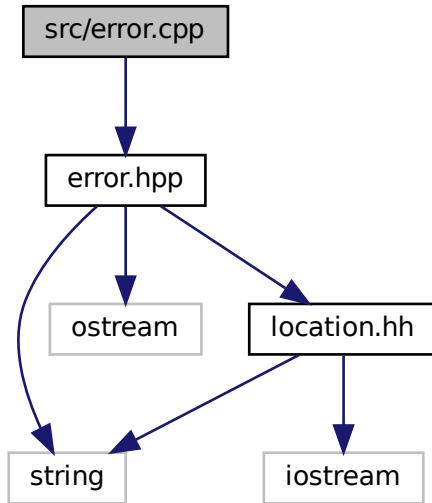
6.111.1 Detailed Description

Define the [Tang::Context](#) class.

6.112 src/error.cpp File Reference

Define the [Tang::Error](#) class.

```
#include "error.hpp"
Include dependency graph for error.cpp:
```



Functions

- std::ostream & [Tang::operator<<](#) (std::ostream &out, const Error &error)

6.112.1 Detailed Description

Define the [Tang::Error](#) class.

6.112.2 Function Documentation

6.112.2.1 operator<<()

```
std::ostream& Tang::operator<< (
    std::ostream & out,
    const Error & error )
```

Parameters

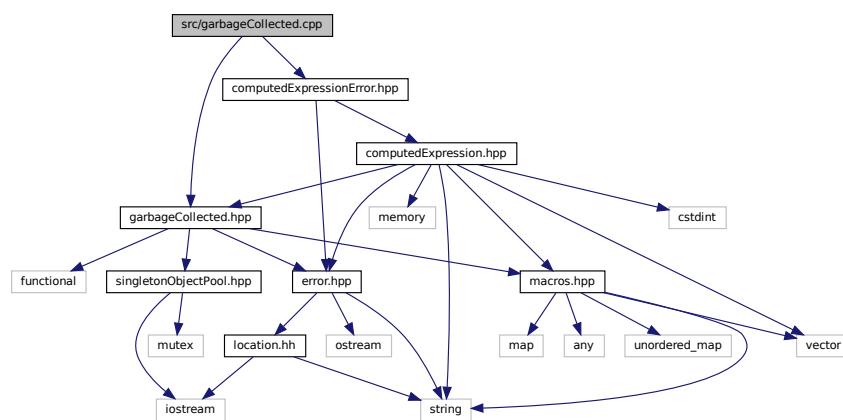
<i>out</i>	The output stream.
<i>error</i>	The Error object.

Returns

The output stream.

6.113 src/garbageCollected.cpp File Reference

```
#include "garbageCollected.hpp"
#include "computedExpressionError.hpp"
Include dependency graph for garbageCollected.cpp:
```



Functions

- std::ostream & [Tang::operator<<](#) (std::ostream &out, const [GarbageCollected](#) &gc)

6.113.1 Function Documentation

6.113.1.1 operator<<()

```
std::ostream& Tang::operator<< (
    std::ostream & out,
    const GarbageCollected & gc )
```

Parameters

<i>out</i>	The output stream.
<i>gc</i>	The GarbageCollected value.

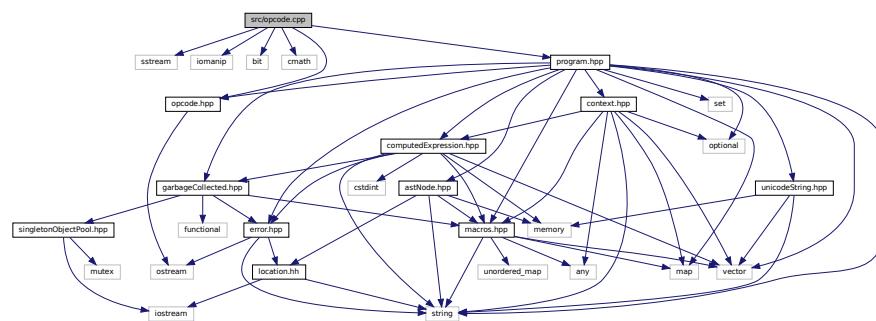
Returns

The output stream.

6.114 src/opcode.cpp File Reference

Define the `Tang::Program::dumpBytecode` method.

```
#include <sstream>
#include <iomanip>
#include <bit>
#include <cmath>
#include "program.hpp"
#include "opcode.hpp"
```



6.114.1 Detailed Description

Define the `Tang::Program::dumpBytecode` method.

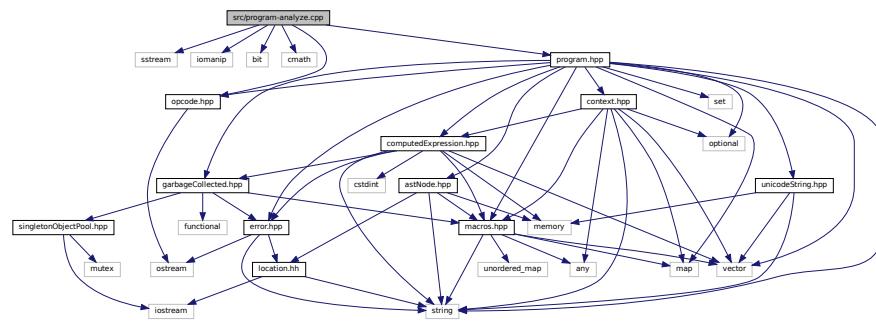
6.115 src/program-analyze.cpp File Reference

Define the `Tang::Program::analyze` method.

```
#include <sstream>
#include <iomanip>
#include <bit>
#include <cmath>
#include "program.hpp"
```

```
#include "opcode.hpp"
```

Include dependency graph for program-analyze.cpp:



Macros

- #define DUMPPROGRAMCHECK(x)

Verify the size of the Bytecode vector so that it may be safely accessed.

6.115.1 Detailed Description

Define the Tang::Program::analyze method.

6.115.2 Macro Definition Documentation

6.115.2.1 DUMPPROGRAMCHECK

```
#define DUMPPROGRAMCHECK( x )
```

Value:

```
if (this->bytecode.size() < (pc + (x))) \
    return {{}, {}}
```

Verify the size of the Bytecode vector so that it may be safely accessed.

If the vector is not large enough, an empty result is returned.

Parameters

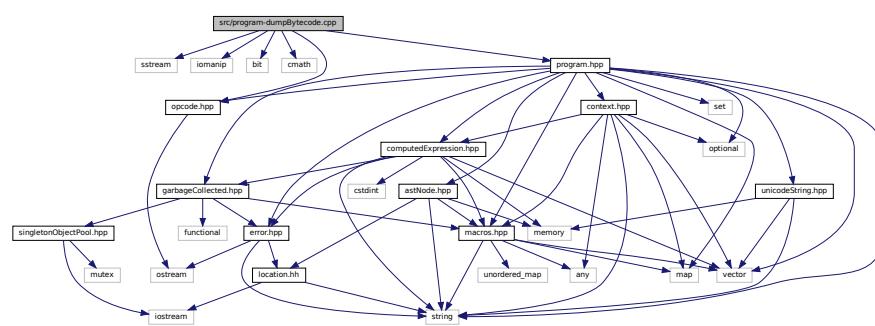
x The number of additional vector entries that should exist.

6.116 src/program-dumpBytecode.cpp File Reference

Define the [Tang::Program::dumpBytecode](#) method.

```
#include <sstream>
#include <iomanip>
#include <bit>
#include <cmath>
#include "program.hpp"
#include "opcode.hpp"
```

Include dependency graph for program-dumpBytecode.cpp:



Macros

- `#define DUMPPROGRAMCHECK(x)`
Verify the size of the Bytecode vector so that it may be safely accessed.
- `#define DUMPBINARY`
- `#define DUMPBINARY_I`
- `#define DUMPBINARY_II`

6.116.1 Detailed Description

Define the [Tang::Program::dumpBytecode](#) method.

6.116.2 Macro Definition Documentation

6.116.2.1 DUMPBINARY

```
#define DUMPBINARY
```

Value:

```
out << (Opcode)this->bytecode[pc]; \
++pc;
```

6.116.2.2 DUMPBINARY_I

```
#define DUMPBINARY_I
```

Value:

```
DUMPPROGRAMCHECK(1); \
out << (Opcode)this->bytecode[pc] \
<< this->bytecode[pc + 1]; \
pc += 2;
```

6.116.2.3 DUMPBINARY_II

```
#define DUMPBINARY_II
```

Value:

```
DUMPPROGRAMCHECK(2); \
out << (Opcode)this->bytecode[pc] \
<< this->bytecode[pc + 1] \
<< ", " \
<< this->bytecode[pc + 2]; \
pc += 3;
```

6.116.2.4 DUMPPROGRAMCHECK

```
#define DUMPPROGRAMCHECK(
    x )
```

Value:

```
if (this->bytecode.size() < (pc + (x))) \
    return out.str() + "Error: Opcode truncated\n"
```

Verify the size of the Bytecode vector so that it may be safely accessed.

If the vector is not large enough, an error message is appended to the output string and no further opcodes are printed.

Parameters

x	The number of additional vector entries that should exist.
---	--

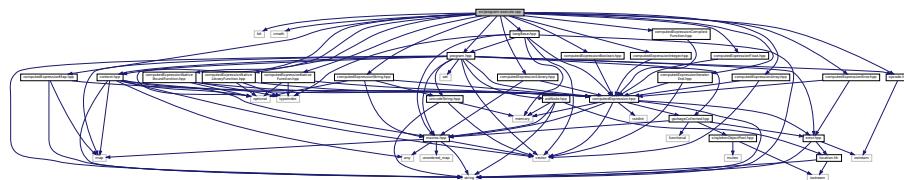
6.117 src/program-execute.cpp File Reference

Define the [Tang::Program::execute](#) method.

```
#include <bit>
#include <cmath>
#include "program.hpp"
#include "context.hpp"
#include "opcode.hpp"
```

```
#include "computedExpressionError.hpp"
#include "computedExpressionInteger.hpp"
#include "computedExpressionFloat.hpp"
#include "computedExpressionBoolean.hpp"
#include "computedExpressionString.hpp"
#include "computedExpressionArray.hpp"
#include "computedExpressionLibrary.hpp"
#include "computedExpressionMap.hpp"
#include "computedExpressionCompiledFunction.hpp"
#include "computedExpressionNativeBoundFunction.hpp"
#include "computedExpressionNativeLibraryFunction.hpp"
#include "computedExpressionNativeFunction.hpp"
#include "computedExpressionIteratorEnd.hpp"
#include "tangBase.hpp"
```

Include dependency graph for program-execute.cpp:



Macros

- `#define EXECUTEPROGRAMCHECK(x)`
Verify the size of the Bytecode vector so that it may be safely accessed.
- `#define STACKCHECK(x)`
Verify the size of the stack vector so that it may be safely accessed.
- `#define PRINTOP_S`
- `#define PRINTOP_I`
- `#define CASTOP_S`
- `#define CASTOP_I`
- `#define UNARYOP_S`
- `#define UNARYOP_I`
- `#define BINARYOP_SS(EXPRESSION)`
- `#define BINARYOP_SI(EXPRESSION)`
- `#define BINARYOP_IS(EXPRESSION)`
- `#define BINARYOP_II(EXPRESSION)`

6.117.1 Detailed Description

Define the [Tang::Program::execute](#) method.

6.117.2 Macro Definition Documentation

6.117.2.1 BINARYOP_II

```
#define BINARYOP_II(
    EXPRESSION )
```

Value:

```
EXECUTEPROGRAMCHECK(2); \
auto lhsIndex = this->bytecode[pc + 1]; \
auto rhsIndex = this->bytecode[pc + 2]; \
STACKCHECK(lhsIndex); \
STACKCHECK(rhsIndex); \
auto & lhs = stack[fp + lhsIndex]; \
auto & rhs = stack[fp + rhsIndex]; \
stack.emplace_back(EXPRESSION); \
pc += 3;
```

6.117.2.2 BINARYOP_IS

```
#define BINARYOP_IS(
    EXPRESSION )
```

Value:

```
EXECUTEPROGRAMCHECK(1); \
auto lhsIndex = this->bytecode[pc + 1]; \
STACKCHECK(lhsIndex); \
auto & rhs = stack.back(); \
auto & lhs = stack[fp + lhsIndex]; \
stack.back() = (EXPRESSION); \
pc += 2;
```

6.117.2.3 BINARYOP_SI

```
#define BINARYOP_SI(
    EXPRESSION )
```

Value:

```
EXECUTEPROGRAMCHECK(1); \
auto rhsIndex = this->bytecode[pc + 1]; \
STACKCHECK(rhsIndex); \
auto & rhs = stack[fp + rhsIndex]; \
auto & lhs = stack.back(); \
stack.back() = (EXPRESSION); \
pc += 2;
```

6.117.2.4 BINARYOP_SS

```
#define BINARYOP_SS(
    EXPRESSION )
```

Value:

```
STACKCHECK(2); \
auto top = stack.size(); \
auto & rhs = stack[top - 1]; \
auto & lhs = stack[top - 2]; \
stack[top - 2] = (EXPRESSION); \
stack.pop_back(); \
++pc;
```

6.117.2.5 CASTOP_I

```
#define CASTOP_I
```

Value:

```
EXECUTEPROGRAMCHECK(1); \
auto index = this->bytecode[pc + 1]; \
STACKCHECK(index); \
auto & operand = stack[fp + index]; \
pc += 2;
```

6.117.2.6 CASTOP_S

```
#define CASTOP_S
```

Value:

```
STACKCHECK(1); \
auto operand = stack.back(); \
stack.pop_back(); \
++pc;
```

6.117.2.7 EXECUTEPROGRAMCHECK

```
#define EXECUTEPROGRAMCHECK(
    x )
```

Value:

```
if (this->bytecode.size() < (pc + (x))) { \
    stack.push_back(GarbageCollected::make<ComputedExpressionError>(Error{"Opcode instruction \
truncated."})); \
    pc = this->bytecode.size(); \
    break; \
}
```

Verify the size of the Bytecode vector so that it may be safely accessed.

Parameters

x	The number of additional vector entries that should exist.
---	--

6.117.2.8 PRINTOP_I

```
#define PRINTOP_I
```

Value:

```
EXECUTEPROGRAMCHECK(1); \
auto index = this->bytecode[pc + 1]; \
STACKCHECK(index); \
auto & expression = stack[fp + index]; \
pc += 2;
```

6.117.2.9 PRINTOP_S

```
#define PRINTOP_S
```

Value:

```
STACKCHECK(1); \
auto expression = stack.back(); \
stack.pop_back(); \
++pc;
```

6.117.2.10 STACKCHECK

```
#define STACKCHECK(
    x )
```

Value:

```
if (stack.size() < (fp + (x))) { \
    stack.push_back(GarbageCollected::make<ComputedExpressionError>(Error{"Insufficient stack depth."})); \
    pc = this->bytecode.size(); \
    break; \
}
```

Verify the size of the stack vector so that it may be safely accessed.

Parameters

x	The number of entries that should exist in the stack.
---	---

6.117.2.11 UNARYOP_I

```
#define UNARYOP_I
```

Value:

```
EXECUTEPROGRAMCHECK(1); \
auto index = this->bytecode[pc + 1]; \
STACKCHECK(index); \
auto & operand = stack[fp + index]; \
pc += 2;
```

6.117.2.12 UNARYOP_S

```
#define UNARYOP_S
```

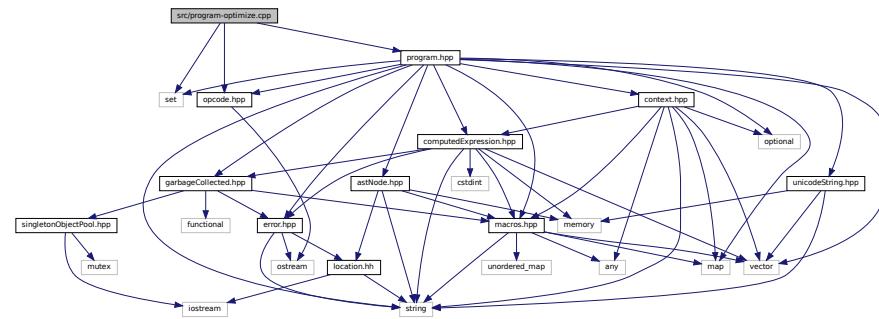
Value:

```
STACKCHECK(1); \
auto operand = stack.back(); \
stack.pop_back(); \
++pc;
```

6.118 src/program-optimize.cpp File Reference

Define the [Tang::Program::optimize](#) method.

```
#include <set>
#include "program.hpp"
#include "opcode.hpp"
Include dependency graph for program-optimize.cpp:
```



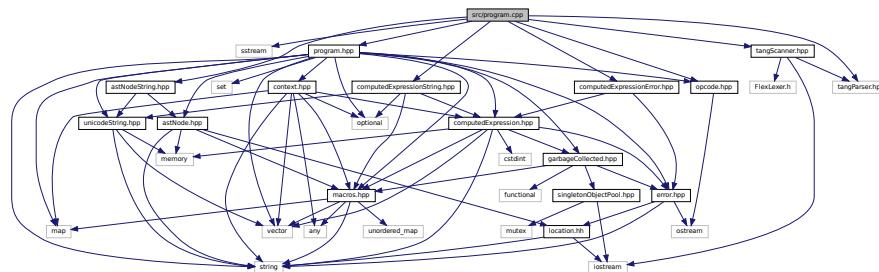
6.118.1 Detailed Description

Define the [Tang::Program::optimize](#) method.

6.119 src/program.cpp File Reference

Define the [Tang::Program](#) class.

```
#include <sstream>
#include "program.hpp"
#include "opcode.hpp"
#include "tangScanner.hpp"
#include "tangParser.hpp"
#include "astNodeString.hpp"
#include "computedExpressionString.hpp"
#include "computedExpressionError.hpp"
Include dependency graph for program.cpp:
```



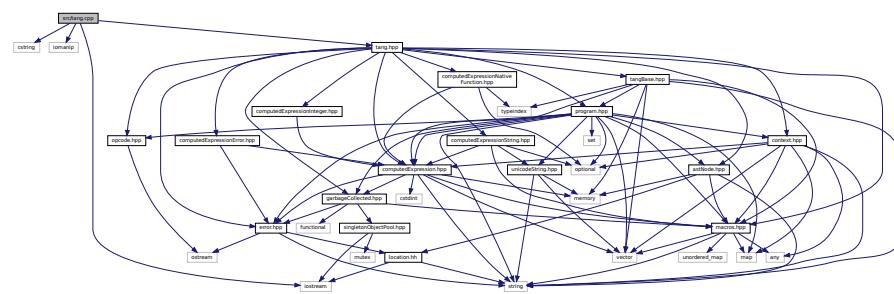
6.119.1 Detailed Description

Define the `Tang::Program` class.

6.120 src/tang.cpp File Reference

Code for the Tang command line interpreter.

```
#include <cstring>
#include <iomanip>
#include <iostream>
#include "tang.hpp"
Include dependency graph for tang.cpp:
```



Functions

- void **printHelpText** ()
 - int **main** (int argc, char *argv[])

6.120.1 Detailed Description

Code for the Tang command line interpreter.

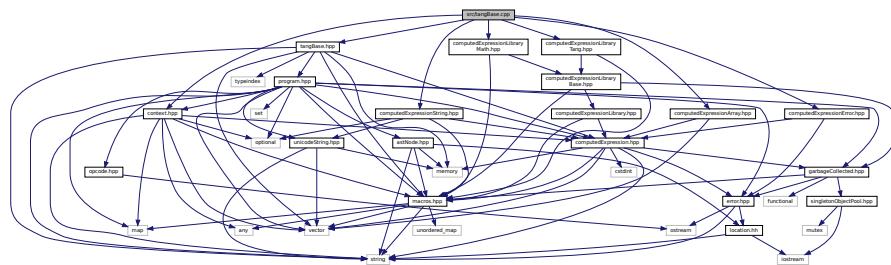
6.121 src/tangBase.cpp File Reference

Define the `Tang::TangBase` class.

```
#include "tangBase.hpp"
#include "computedExpressionArray.hpp"
#include "computedExpressionString.hpp"
#include "computedExpressionError.hpp"
#include "computedExpressionLibraryMath.hpp"
#include "computedExpressionLibraryTang.hpp"
```

```
#include "context.hpp"
```

Include dependency graph for tangBase.cpp:



Macros

- `#define OBJECTMETHOD(type) {type_index(typeid(type)), type::getMethods()}`
 - `#define LIBRARY(alias, type)`
 - `#define LIBRARYATTRIBUTES(type) {type_index(typeid(type)), type::getLibraryAttributes()}`

6.121.1 Detailed Description

Define the `Tang::TangBase` class.

6.121.2 Macro Definition Documentation

6.121.2.1 LIBRARY

```
#define LIBRARY( alias, type )
```

Value:

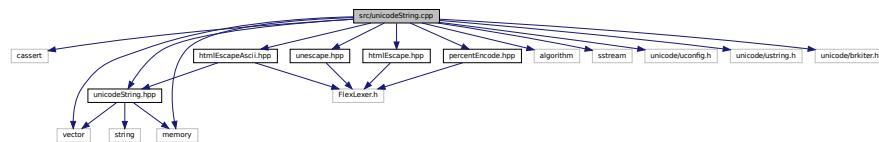
```
    {alias, []}([[maybe_unused]] Context & context) { \
    return GarbageCollected::make<type>(); \
}
```

6.122 src/unicodeString.cpp File Reference

Contains the function declarations for the [Tang::UnicodeString](#) class and the interface to ICU.

```
#include <cassert>
#include <vector>
#include <memory>
#include <algorithm>
#include <iostream>
#include <sstream>
#include <unicode/uconfig.h>
```

```
#include <unicode/ustring.h>
#include <unicode/brkiter.h>
#include "unicodeString.hpp"
#include "unescape.hpp"
#include "htmlEscape.hpp"
#include "htmlEscapeAscii.hpp"
#include "percentEncode.hpp"
Include dependency graph for unicodeString.cpp:
```



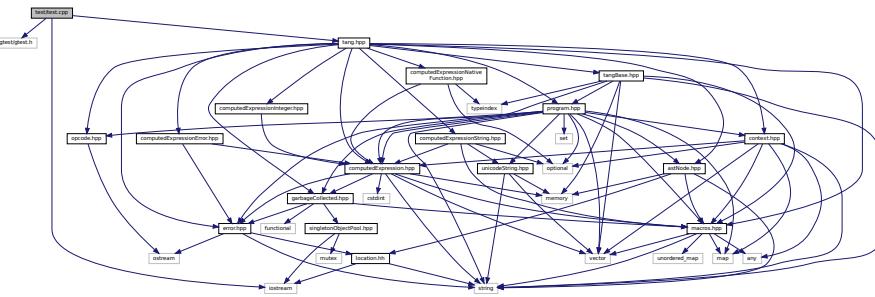
6.122.1 Detailed Description

Contains the function declarations for the `Tang::UnicodeString` class and the interface to ICU.

6.123 test/test.cpp File Reference

Test the general language behaviors.

```
#include <gtest/gtest.h>
#include <iostream>
#include "tang.hpp"
Include dependency graph for test.cpp:
```



Functions

- **TEST** (Declare, Null)
 - **TEST** (Declare, Integer)
 - **TEST** (Declare, Float)
 - **TEST** (Declare, Boolean)
 - **TEST** (Declare, String)
 - **TEST** (Expression, Add)
 - **TEST** (Expression, Subtract)

- **TEST** (Expression, Multiplication)
- **TEST** (Expression, Division)
- **TEST** (Expression, Modulo)
- **TEST** (Expression, UnaryMinus)
- **TEST** (Expression, Parentheses)
- **TEST** (Expression, TypeCast)
- **TEST** (Expression, Not)
- **TEST** (Expression, LessThan)
- **TEST** (Expression, LessThanEqual)
- **TEST** (Expression, GreaterThan)
- **TEST** (Expression, GreaterThanEqual)
- **TEST** (Expression, Equal)
- **TEST** (Expression, NotEqual)
- **TEST** (Expression, And)
- **TEST** (Expression, Or)
- **TEST** (Expression, Ternary)
- **TEST** (Expression, StringIndex)
- **TEST** (Expression, StringSlice)
- **TEST** (Expression, ArrayIndex)
- **TEST** (Expression, Map)
- **TEST** (CodeBlock, Statements)
- **TEST** (Assign, Identifier)
- **TEST** (Assign, Index)
- **TEST** (Expression, ArraySlice)
- **TEST** (ControlFlow, IfElse)
- **TEST** (ControlFlow, While)
- **TEST** (ControlFlow, Break)
- **TEST** (ControlFlow, Continue)
- **TEST** (ControlFlow, DoWhile)
- **TEST** (ControlFlow, For)
- **TEST** (ControlFlow, RangedFor)
- **TEST** (Print, Default)
- **TEST** (Print, Array)
- **TEST** (Syntax, SingleLineComment)
- **TEST** (Syntax, MultiLineComment)
- **TEST** (Syntax, UntrustedString)
- **TEST** (Syntax, UntrustedStringLiteral)
- **TEST** (Syntax, PercentEncodedString)
- **TEST** (NativeFunctions, General)
- **TEST** ([Context](#), General)
- **TEST** (Compile, Template)
- **TEST** (Compile, ShortCodes)
- **TEST** (Library, Use)
- **TEST** (Library, Tang)
- **TEST** (Optimization, Subtract)
- int **main** (int argc, char **argv)

Variables

- auto **tang** = TangBase::make_shared()

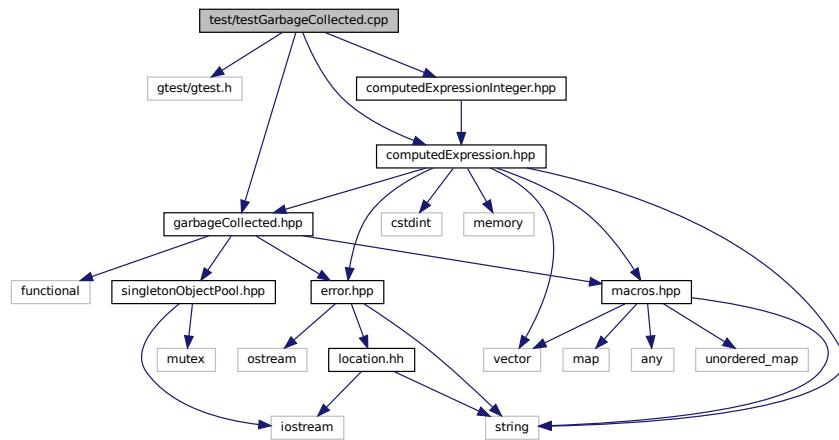
6.123.1 Detailed Description

Test the general language behaviors.

6.124 test/testGarbageCollected.cpp File Reference

Test the generic behavior of the [Tang::GarbageCollected](#) class.

```
#include <gtest/gtest.h>
#include "garbageCollected.hpp"
#include "computedExpression.hpp"
#include "computedExpressionInteger.hpp"
Include dependency graph for testGarbageCollected.cpp:
```



Functions

- **TEST** (Create, Access)
 - **TEST** (RuleOfFive, CopyConstructor)
 - **TEST** (Recycle, ObjectIsRecycled)
 - **TEST** (Recycle, ObjectIsNotRecycled)
 - int **main** (int argc, char **argv)

6.124.1 Detailed Description

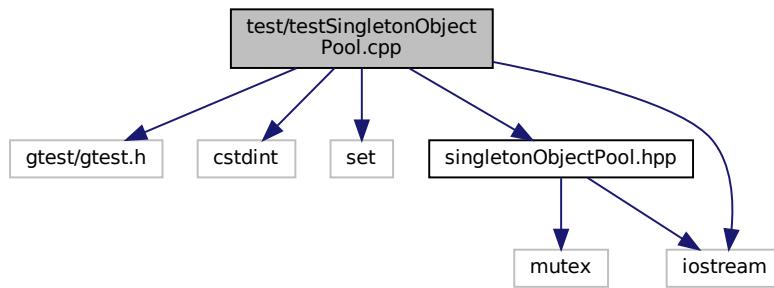
Test the generic behavior of the `Tang::GarbageCollected` class.

6.125 test/testSingletonObjectPool.cpp File Reference

Test the generic behavior of the [Tang::SingletonObjectPool](#) class.

```
#include <gtest/gtest.h>
#include <cstdint>
#include <set>
#include "singletonObjectPool.hpp"
#include <iostream>
```

Include dependency graph for testSingletonObjectPool.cpp:



Functions

- [**TEST** \(Singleton, SameForSameType\)](#)
- [**TEST** \(Singleton, DifferentForDifferentTypes\)](#)
- [**TEST** \(Get, SuccessiveCallsProduceDifferentMemoryAddresses\)](#)
- [**TEST** \(Recycle, RecycledObjectIsReused\)](#)
- [**TEST** \(Get, SuccessiveCallsAreSequential\)](#)
- [**TEST** \(Get, KeepsGeneratingDifferentPointers\)](#)
- [**TEST** \(Recycle, WorksAfterLargeNumberOfAllocations\)](#)
- int **main** (int argc, char **argv)

6.125.1 Detailed Description

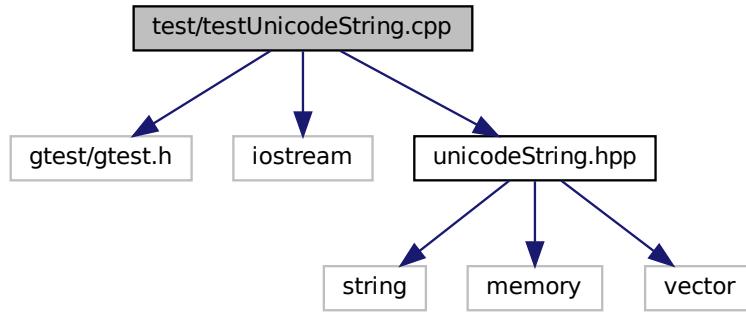
Test the generic behavior of the [Tang::SingletonObjectPool](#) class.

6.126 test/testUnicodeString.cpp File Reference

Contains tests for the [Tang::UnicodeString](#) class.

```
#include <gtest/gtest.h>
#include <iostream>
```

```
#include "unicodeString.hpp"
Include dependency graph for testUnicodeString.cpp:
```



Functions

- `TEST (Core, Unescape)`
- `TEST (Core, HtmlEscape)`
- `TEST (Core, HtmlEscapeAscii)`
- `TEST (UnicodeString, SubString)`
- `TEST (UnicodeString, Types)`
- `TEST (Core, PercentEncode)`
- int `main` (int argc, char **argv)

6.126.1 Detailed Description

Contains tests for the [Tang::UnicodeString](#) class.

Index

—add
 Tang::ComputedExpression, 153
 Tang::ComputedExpressionArray, 166
 Tang::ComputedExpressionBoolean, 181
 Tang::ComputedExpressionCompiledFunction, 194
 Tang::ComputedExpressionError, 207
 Tang::ComputedExpressionFloat, 220
 Tang::ComputedExpressionInteger, 234
 Tang::ComputedExpressionIterator, 248
 Tang::ComputedExpressionIteratorEnd, 262
 Tang::ComputedExpressionLibrary, 276
 Tang::ComputedExpressionLibraryBase, 290
 Tang::ComputedExpressionMap, 305
 Tang::ComputedExpressionNativeBoundFunction, 319
 Tang::ComputedExpressionNativeFunction, 334
 Tang::ComputedExpressionNativeLibraryFunction, 349
 Tang::ComputedExpressionString, 365

—asCode
 Tang::ComputedExpression, 153
 Tang::ComputedExpressionArray, 166
 Tang::ComputedExpressionBoolean, 181
 Tang::ComputedExpressionCompiledFunction, 194
 Tang::ComputedExpressionError, 207
 Tang::ComputedExpressionFloat, 220
 Tang::ComputedExpressionInteger, 234
 Tang::ComputedExpressionIterator, 249
 Tang::ComputedExpressionIteratorEnd, 263
 Tang::ComputedExpressionLibrary, 277
 Tang::ComputedExpressionLibraryBase, 291
 Tang::ComputedExpressionMap, 305
 Tang::ComputedExpressionNativeBoundFunction, 320
 Tang::ComputedExpressionNativeFunction, 335
 Tang::ComputedExpressionNativeLibraryFunction, 350
 Tang::ComputedExpressionString, 365

—assign_index
 Tang::ComputedExpression, 153
 Tang::ComputedExpressionArray, 167
 Tang::ComputedExpressionBoolean, 182
 Tang::ComputedExpressionCompiledFunction, 194
 Tang::ComputedExpressionError, 208
 Tang::ComputedExpressionFloat, 220
 Tang::ComputedExpressionInteger, 234
 Tang::ComputedExpressionIterator, 249
 Tang::ComputedExpressionIteratorEnd, 263
 Tang::ComputedExpressionLibrary, 277

—divide
 Tang::ComputedExpression, 154
 Tang::ComputedExpressionArray, 168
 Tang::ComputedExpressionBoolean, 182
 Tang::ComputedExpressionCompiledFunction, 195
 Tang::ComputedExpressionError, 208
 Tang::ComputedExpressionFloat, 221
 Tang::ComputedExpressionInteger, 235
 Tang::ComputedExpressionIterator, 250
 Tang::ComputedExpressionIteratorEnd, 264
 Tang::ComputedExpressionLibrary, 278
 Tang::ComputedExpressionLibraryBase, 292
 Tang::ComputedExpressionMap, 306
 Tang::ComputedExpressionNativeBoundFunction, 321
 Tang::ComputedExpressionNativeFunction, 336
 Tang::ComputedExpressionNativeLibraryFunction, 351
 Tang::ComputedExpressionString, 367

—equal
 Tang::ComputedExpression, 154
 Tang::ComputedExpressionArray, 168

Tang::ComputedExpressionBoolean, 183
 Tang::ComputedExpressionCompiledFunction, 196
 Tang::ComputedExpressionError, 209
 Tang::ComputedExpressionFloat, 222
 Tang::ComputedExpressionInteger, 236
 Tang::ComputedExpressionIterator, 250
 Tang::ComputedExpressionIteratorEnd, 264
 Tang::ComputedExpressionLibrary, 278
 Tang::ComputedExpressionLibraryBase, 292
 Tang::ComputedExpressionMap, 307
 Tang::ComputedExpressionNativeBoundFunction, 321
 Tang::ComputedExpressionNativeFunction, 336
 Tang::ComputedExpressionNativeLibraryFunction, 351
 Tang::ComputedExpressionString, 367
 __float
 Tang::ComputedExpression, 155
 Tang::ComputedExpressionArray, 169
 Tang::ComputedExpressionBoolean, 183
 Tang::ComputedExpressionCompiledFunction, 196
 Tang::ComputedExpressionError, 209
 Tang::ComputedExpressionFloat, 222
 Tang::ComputedExpressionInteger, 236
 Tang::ComputedExpressionIterator, 251
 Tang::ComputedExpressionIteratorEnd, 265
 Tang::ComputedExpressionLibrary, 279
 Tang::ComputedExpressionLibraryBase, 293
 Tang::ComputedExpressionMap, 307
 Tang::ComputedExpressionNativeBoundFunction, 322
 Tang::ComputedExpressionNativeFunction, 337
 Tang::ComputedExpressionNativeLibraryFunction, 352
 Tang::ComputedExpressionString, 368
 __getIterator
 Tang::ComputedExpression, 155
 Tang::ComputedExpressionArray, 169
 Tang::ComputedExpressionBoolean, 183
 Tang::ComputedExpressionCompiledFunction, 196
 Tang::ComputedExpressionError, 209
 Tang::ComputedExpressionFloat, 223
 Tang::ComputedExpressionInteger, 237
 Tang::ComputedExpressionIterator, 251
 Tang::ComputedExpressionIteratorEnd, 265
 Tang::ComputedExpressionLibrary, 279
 Tang::ComputedExpressionLibraryBase, 293
 Tang::ComputedExpressionMap, 307
 Tang::ComputedExpressionNativeBoundFunction, 322
 Tang::ComputedExpressionNativeFunction, 337
 Tang::ComputedExpressionNativeLibraryFunction, 352
 Tang::ComputedExpressionString, 368
 __index
 Tang::ComputedExpression, 155
 Tang::ComputedExpressionArray, 169
 Tang::ComputedExpressionBoolean, 184
 Tang::ComputedExpressionCompiledFunction, 197
 Tang::ComputedExpressionError, 210
 Tang::ComputedExpressionFloat, 223
 Tang::ComputedExpressionInteger, 237
 Tang::ComputedExpressionIterator, 251
 Tang::ComputedExpressionIteratorEnd, 265
 Tang::ComputedExpressionLibrary, 279
 Tang::ComputedExpressionLibraryBase, 293
 Tang::ComputedExpressionMap, 308
 Tang::ComputedExpressionNativeBoundFunction, 322
 Tang::ComputedExpressionNativeFunction, 338
 Tang::ComputedExpressionNativeLibraryFunction, 352
 Tang::ComputedExpressionString, 369
 __integer
 Tang::ComputedExpression, 156
 Tang::ComputedExpressionArray, 170
 Tang::ComputedExpressionBoolean, 184
 Tang::ComputedExpressionCompiledFunction, 197
 Tang::ComputedExpressionError, 210
 Tang::ComputedExpressionFloat, 223
 Tang::ComputedExpressionInteger, 237
 Tang::ComputedExpressionIterator, 252
 Tang::ComputedExpressionIteratorEnd, 266
 Tang::ComputedExpressionLibrary, 280
 Tang::ComputedExpressionLibraryBase, 294
 Tang::ComputedExpressionMap, 308
 Tang::ComputedExpressionNativeBoundFunction, 323
 Tang::ComputedExpressionNativeFunction, 338
 Tang::ComputedExpressionNativeLibraryFunction, 353
 Tang::ComputedExpressionString, 369
 __iteratorNext
 Tang::ComputedExpression, 156
 Tang::ComputedExpressionArray, 170
 Tang::ComputedExpressionBoolean, 184
 Tang::ComputedExpressionCompiledFunction, 197
 Tang::ComputedExpressionError, 210
 Tang::ComputedExpressionFloat, 223
 Tang::ComputedExpressionInteger, 237
 Tang::ComputedExpressionIterator, 252
 Tang::ComputedExpressionIteratorEnd, 266
 Tang::ComputedExpressionLibrary, 280
 Tang::ComputedExpressionLibraryBase, 294
 Tang::ComputedExpressionMap, 308
 Tang::ComputedExpressionNativeBoundFunction, 323
 Tang::ComputedExpressionNativeFunction, 338
 Tang::ComputedExpressionNativeLibraryFunction, 353
 Tang::ComputedExpressionString, 369
 __lessThan
 Tang::ComputedExpression, 156
 Tang::ComputedExpressionArray, 170
 Tang::ComputedExpressionBoolean, 185
 Tang::ComputedExpressionCompiledFunction, 198

Tang::ComputedExpressionError, 211
Tang::ComputedExpressionFloat, 224
Tang::ComputedExpressionInteger, 238
Tang::ComputedExpressionIterator, 252
Tang::ComputedExpressionIteratorEnd, 266
Tang::ComputedExpressionLibrary, 280
Tang::ComputedExpressionLibraryBase, 294
Tang::ComputedExpressionMap, 309
Tang::ComputedExpressionNativeBoundFunction,
 323
Tang::ComputedExpressionNativeFunction, 339
Tang::ComputedExpressionNativeLibraryFunction,
 353
Tang::ComputedExpressionString, 370
modulo
 Tang::ComputedExpression, 157
 Tang::ComputedExpressionArray, 171
 Tang::ComputedExpressionBoolean, 185
 Tang::ComputedExpressionCompiledFunction, 198
 Tang::ComputedExpressionError, 211
 Tang::ComputedExpressionFloat, 224
 Tang::ComputedExpressionInteger, 238
 Tang::ComputedExpressionIterator, 253
 Tang::ComputedExpressionIteratorEnd, 267
 Tang::ComputedExpressionLibrary, 281
 Tang::ComputedExpressionLibraryBase, 295
 Tang::ComputedExpressionMap, 309
 Tang::ComputedExpressionNativeBoundFunction,
 325
 Tang::ComputedExpressionNativeFunction, 339
 Tang::ComputedExpressionNativeLibraryFunction,
 355
 Tang::ComputedExpressionString, 371
multiply
 Tang::ComputedExpression, 157
 Tang::ComputedExpressionArray, 171
 Tang::ComputedExpressionBoolean, 185
 Tang::ComputedExpressionCompiledFunction, 198
 Tang::ComputedExpressionError, 211
 Tang::ComputedExpressionFloat, 225
 Tang::ComputedExpressionInteger, 239
 Tang::ComputedExpressionIterator, 253
 Tang::ComputedExpressionIteratorEnd, 267
 Tang::ComputedExpressionLibrary, 281
 Tang::ComputedExpressionLibraryBase, 295
 Tang::ComputedExpressionMap, 310
 Tang::ComputedExpressionNativeBoundFunction,
 325
 Tang::ComputedExpressionNativeFunction, 339
 Tang::ComputedExpressionNativeLibraryFunction,
 355
 Tang::ComputedExpressionString, 371
negative
 Tang::ComputedExpression, 158
 Tang::ComputedExpressionArray, 172
 Tang::ComputedExpressionBoolean, 186
 Tang::ComputedExpressionCompiledFunction, 199
 Tang::ComputedExpressionError, 212
Tang::ComputedExpressionFloat, 225
Tang::ComputedExpressionInteger, 240
Tang::ComputedExpressionIterator, 254
Tang::ComputedExpressionIteratorEnd, 268
Tang::ComputedExpressionLibrary, 281
Tang::ComputedExpressionLibraryBase, 295
Tang::ComputedExpressionMap, 310
Tang::ComputedExpressionNativeBoundFunction,
 325
Tang::ComputedExpressionNativeFunction, 340
Tang::ComputedExpressionNativeLibraryFunction,
 355
Tang::ComputedExpressionString, 372
not
 Tang::ComputedExpression, 158
 Tang::ComputedExpressionArray, 172
 Tang::ComputedExpressionBoolean, 186
 Tang::ComputedExpressionCompiledFunction, 199
 Tang::ComputedExpressionError, 212
 Tang::ComputedExpressionFloat, 225
 Tang::ComputedExpressionInteger, 240
 Tang::ComputedExpressionIterator, 254
 Tang::ComputedExpressionIteratorEnd, 268
 Tang::ComputedExpressionLibrary, 281
 Tang::ComputedExpressionLibraryBase, 295
 Tang::ComputedExpressionMap, 310
 Tang::ComputedExpressionNativeBoundFunction,
 326
 Tang::ComputedExpressionNativeFunction, 340
 Tang::ComputedExpressionNativeLibraryFunction,
 356
 Tang::ComputedExpressionString, 372
period
 Tang::ComputedExpression, 158
 Tang::ComputedExpressionArray, 172
 Tang::ComputedExpressionBoolean, 186
 Tang::ComputedExpressionCompiledFunction, 199
 Tang::ComputedExpressionError, 212
 Tang::ComputedExpressionFloat, 226
 Tang::ComputedExpressionInteger, 240
 Tang::ComputedExpressionIterator, 254
 Tang::ComputedExpressionIteratorEnd, 268
 Tang::ComputedExpressionLibrary, 281
 Tang::ComputedExpressionLibraryBase, 295
 Tang::ComputedExpressionMap, 310
 Tang::ComputedExpressionNativeBoundFunction,
 326
 Tang::ComputedExpressionNativeFunction, 340
 Tang::ComputedExpressionNativeLibraryFunction,
 356
 Tang::ComputedExpressionString, 372
slice
 Tang::ComputedExpression, 159
 Tang::ComputedExpressionArray, 173
 Tang::ComputedExpressionBoolean, 187
 Tang::ComputedExpressionCompiledFunction, 200
 Tang::ComputedExpressionError, 213
 Tang::ComputedExpressionFloat, 226

Tang::ComputedExpressionInteger, 240
 Tang::ComputedExpressionIterator, 255
 Tang::ComputedExpressionIteratorEnd, 268
 Tang::ComputedExpressionLibrary, 282
 Tang::ComputedExpressionLibraryBase, 296
 Tang::ComputedExpressionMap, 311
 Tang::ComputedExpressionNativeBoundFunction, 326
 Tang::ComputedExpressionNativeFunction, 341
 Tang::ComputedExpressionNativeLibraryFunction, 356
 Tang::ComputedExpressionString, 373
 __string
 Tang::ComputedExpression, 159
 Tang::ComputedExpressionArray, 173
 Tang::ComputedExpressionBoolean, 187
 Tang::ComputedExpressionCompiledFunction, 200
 Tang::ComputedExpressionError, 213
 Tang::ComputedExpressionFloat, 227
 Tang::ComputedExpressionInteger, 241
 Tang::ComputedExpressionIterator, 255
 Tang::ComputedExpressionIteratorEnd, 269
 Tang::ComputedExpressionLibrary, 283
 Tang::ComputedExpressionLibraryBase, 297
 Tang::ComputedExpressionMap, 311
 Tang::ComputedExpressionNativeBoundFunction, 327
 Tang::ComputedExpressionNativeFunction, 341
 Tang::ComputedExpressionNativeLibraryFunction, 357
 Tang::ComputedExpressionString, 374
 __subtract
 Tang::ComputedExpression, 159
 Tang::ComputedExpressionArray, 174
 Tang::ComputedExpressionBoolean, 187
 Tang::ComputedExpressionCompiledFunction, 200
 Tang::ComputedExpressionError, 213
 Tang::ComputedExpressionFloat, 227
 Tang::ComputedExpressionInteger, 241
 Tang::ComputedExpressionIterator, 255
 Tang::ComputedExpressionIteratorEnd, 269
 Tang::ComputedExpressionLibrary, 283
 Tang::ComputedExpressionLibraryBase, 297
 Tang::ComputedExpressionMap, 312
 Tang::ComputedExpressionNativeBoundFunction, 327
 Tang::ComputedExpressionNativeFunction, 341
 Tang::ComputedExpressionNativeLibraryFunction, 357
 Tang::ComputedExpressionString, 374
 ~GarbageCollected
 Tang::GarbageCollected, 386
 Add
 Tang::AstNodeBinary, 32
 ADD_II
 opcode.hpp, 498
 ADD_IS
 opcode.hpp, 498
 ADD_SI
 opcode.hpp, 498
 ADD_SS
 opcode.hpp, 498
 addBreak
 Tang::Program, 412
 addBytecode
 Tang::Program, 413
 addContinue
 Tang::Program, 413
 addIdentifier
 Tang::Program, 413
 addIdentifierAssigned
 Tang::Program, 413
 addLibraryAlias
 Tang::Program, 414
 addString
 Tang::Program, 414
 And
 Tang::AstNodeBinary, 32
 append
 Tang::ComputedExpressionArray, 174
 ARRAY
 opcode.hpp, 498
 ASSIGNINDEX
 opcode.hpp, 498
 AstNode
 Tang::AstNode, 18
 AstNodeArray
 Tang::AstNodeArray, 23
 AstNodeAssign
 Tang::AstNodeAssign, 27
 AstNodeBinary
 Tang::AstNodeBinary, 33
 astNodeBinary.cpp
 LOGICALOP, 515
 AstNodeBlock
 Tang::AstNodeBlock, 37
 AstNodeBoolean
 Tang::AstNodeBoolean, 41
 AstNodeBreak
 Tang::AstNodeBreak, 45
 AstNodeCast
 Tang::AstNodeCast, 50
 AstNodeContinue
 Tang::AstNodeContinue, 53
 AstNodeDoWhile
 Tang::AstNodeDoWhile, 58
 AstNodeFloat
 Tang::AstNodeFloat, 62
 AstNodeFor
 Tang::AstNodeFor, 67
 AstNodeFunctionCall
 Tang::AstNodeFunctionCall, 71
 AstNodeFunctionDeclaration
 Tang::AstNodeFunctionDeclaration, 74
 AstNodeIdentifier
 Tang::AstNodeIdentifier, 79

AstNodeIfElse
 Tang::AstNodeIfElse, 84

AstNodeIndex
 Tang::AstNodeIndex, 88

AstNodeInteger
 Tang::AstNodeInteger, 93

AstNodeLibrary
 Tang::AstNodeLibrary, 97

AstNodeMap
 Tang::AstNodeMap, 101

AstNodePeriod
 Tang::AstNodePeriod, 105

AstNodePrint
 Tang::AstNodePrint, 110

AstNodeRangedFor
 Tang::AstNodeRangedFor, 113

AstNodeReturn
 Tang::AstNodeReturn, 118

AstNodeSlice
 Tang::AstNodeSlice, 123

AstNodeString
 Tang::AstNodeString, 127, 128

AstNodeTernary
 Tang::AstNodeTernary, 133

AstNodeUnary
 Tang::AstNodeUnary, 138

AstNodeUse
 Tang::AstNodeUse, 143

AstNodeWhile
 Tang::AstNodeWhile, 148

BINARYOP
 macros.hpp, 495

BINARYOP_II
 program-execute.cpp, 547

BINARYOP_IS
 program-execute.cpp, 548

BINARYOP_SI
 program-execute.cpp, 548

BINARYOP_SS
 program-execute.cpp, 548

BOOLEAN
 opcode.hpp, 498

Boolean
 Tang::AstNodeCast, 50

build/generated/location.hh, 441

bytesLength
 Tang::ComputedExpressionString, 374

 Tang::UnicodeString, 435

CALLFUNC
 opcode.hpp, 500

CALLFUNC_I
 opcode.hpp, 500

CASTBOOLEAN_I
 opcode.hpp, 500

CASTBOOLEAN_S
 opcode.hpp, 500

CASTFLOAT_I
 opcode.hpp, 500

CASTFLOAT_S
 opcode.hpp, 500

CASTINTEGER_I
 opcode.hpp, 500

CASTINTEGER_S
 opcode.hpp, 500

CASTOP_I
 program-execute.cpp, 548

CASTOP_S
 program-execute.cpp, 549

CASTSTRING_I
 opcode.hpp, 500

CASTSTRING_S
 opcode.hpp, 500

CodeType
 Tang::Program, 411

compile
 Tang::AstNode, 19

 Tang::AstNodeArray, 24

 Tang::AstNodeAssign, 28

 Tang::AstNodeBinary, 33

 Tang::AstNodeBlock, 38

 Tang::AstNodeBoolean, 42

 Tang::AstNodeBreak, 45

 Tang::AstNodeCast, 50

 Tang::AstNodeContinue, 54

 Tang::AstNodeDoWhile, 59

 Tang::AstNodeFloat, 63

 Tang::AstNodeFor, 67

 Tang::AstNodeFunctionCall, 71

 Tang::AstNodeFunctionDeclaration, 75

 Tang::AstNodeIdentifier, 79

 Tang::AstNodeIfElse, 84

 Tang::AstNodeIndex, 89

 Tang::AstNodeInteger, 94

 Tang::AstNodeLibrary, 98

 Tang::AstNodeMap, 101

 Tang::AstNodePeriod, 106

 Tang::AstNodePrint, 110

 Tang::AstNodeRangedFor, 114

 Tang::AstNodeReturn, 119

 Tang::AstNodeSlice, 123

 Tang::AstNodeString, 128

 Tang::AstNodeTernary, 134

 Tang::AstNodeUnary, 138

 Tang::AstNodeUse, 144

 Tang::AstNodeWhile, 149

compileLiteral
 Tang::AstNodeString, 129

compilePreprocess
 Tang::AstNode, 19

 Tang::AstNodeArray, 24

 Tang::AstNodeAssign, 28

 Tang::AstNodeBinary, 34

 Tang::AstNodeBlock, 38

 Tang::AstNodeBoolean, 42

 Tang::AstNodeBreak, 46

Tang::AstNodeCast, 50
 Tang::AstNodeContinue, 54
 Tang::AstNodeDoWhile, 59
 Tang::AstNodeFloat, 63
 Tang::AstNodeFor, 68
 Tang::AstNodeFunctionCall, 72
 Tang::AstNodeFunctionDeclaration, 75
 Tang::AstNodeIdentifier, 80
 Tang::AstNodeIfElse, 85
 Tang::AstNodeIndex, 89
 Tang::AstNodeInteger, 94
 Tang::AstNodeLibrary, 98
 Tang::AstNodeMap, 102
 Tang::AstNodePeriod, 106
 Tang::AstNodePrint, 110
 Tang::AstNodeRangedFor, 114
 Tang::AstNodeReturn, 119
 Tang::AstNodeSlice, 124
 Tang::AstNodeString, 129
 Tang::AstNodeTernary, 134
 Tang::AstNodeUnary, 140
 Tang::AstNodeUse, 144
 Tang::AstNodeWhile, 149
compileScript
 Tang::TangBase, 425, 426
compileTemplate
 Tang::TangBase, 426
ComputedExpressionArray
 Tang::ComputedExpressionArray, 166
ComputedExpressionBoolean
 Tang::ComputedExpressionBoolean, 181
ComputedExpressionCompiledFunction
 Tang::ComputedExpressionCompiledFunction, 193
ComputedExpressionError
 Tang::ComputedExpressionError, 207
ComputedExpressionFloat
 Tang::ComputedExpressionFloat, 219
ComputedExpressionInteger
 Tang::ComputedExpressionInteger, 233
ComputedExpressionIterator
 Tang::ComputedExpressionIterator, 248
ComputedExpressionMap
 Tang::ComputedExpressionMap, 305
ComputedExpressionNativeBoundFunction
 Tang::ComputedExpressionNativeBoundFunction,
 318
ComputedExpressionNativeFunction
 Tang::ComputedExpressionNativeFunction, 334
ComputedExpressionNativeLibraryFunction
 Tang::ComputedExpressionNativeLibraryFunction,
 349
ComputedExpressionString
 Tang::ComputedExpressionString, 364
COPY
 opcode.hpp, 498
currentIndex
 Tang::SingletonObjectPool< T >, 423
currentRecycledIndex

Tang::SingletonObjectPool< T >, 423
Default
 Tang::AstNode, 18
 Tang::AstNodeArray, 23
 Tang::AstNodeAssign, 27
 Tang::AstNodeBinary, 33
 Tang::AstNodeBlock, 37
 Tang::AstNodeBoolean, 41
 Tang::AstNodeBreak, 45
 Tang::AstNodeCast, 49
 Tang::AstNodeContinue, 53
 Tang::AstNodeDoWhile, 58
 Tang::AstNodeFloat, 62
 Tang::AstNodeFor, 66
 Tang::AstNodeFunctionCall, 70
 Tang::AstNodeFunctionDeclaration, 74
 Tang::AstNodeIdentifier, 78
 Tang::AstNodeIfElse, 83
 Tang::AstNodeIndex, 88
 Tang::AstNodeInteger, 93
 Tang::AstNodeLibrary, 97
 Tang::AstNodeMap, 101
 Tang::AstNodePeriod, 105
 Tang::AstNodePrint, 109, 110
 Tang::AstNodeRangedFor, 113
 Tang::AstNodeReturn, 118
 Tang::AstNodeSlice, 122
 Tang::AstNodeString, 127
 Tang::AstNodeTernary, 133
 Tang::AstNodeUnary, 138
 Tang::AstNodeUse, 143
 Tang::AstNodeWhile, 148
Divide
 Tang::AstNodeBinary, 32
DIVIDE_II
 opcode.hpp, 499
DIVIDE_IS
 opcode.hpp, 499
DIVIDE_SI
 opcode.hpp, 498
DIVIDE_SS
 opcode.hpp, 498
dump
 Tang::AstNode, 20
 Tang::AstNodeArray, 25
 Tang::AstNodeAssign, 29
 Tang::AstNodeBinary, 34
 Tang::AstNodeBlock, 39
 Tang::AstNodeBoolean, 43
 Tang::AstNodeBreak, 47
 Tang::AstNodeCast, 51
 Tang::AstNodeContinue, 55
 Tang::AstNodeDoWhile, 60
 Tang::AstNodeFloat, 64
 Tang::AstNodeFor, 68
 Tang::AstNodeFunctionCall, 72
 Tang::AstNodeFunctionDeclaration, 76
 Tang::AstNodeIdentifier, 80

Tang::AstNodeElse, 85
Tang::AstNodeIndex, 90
Tang::AstNodeInteger, 95
Tang::AstNodeLibrary, 99
Tang::AstNodeMap, 103
Tang::AstNodePeriod, 107
Tang::AstNodePrint, 111
Tang::AstNodeRangedFor, 115
Tang::AstNodeReturn, 120
Tang::AstNodeSlice, 124
Tang::AstNodeString, 130
Tang::AstNodeTernary, 135
Tang::AstNodeUnary, 140
Tang::AstNodeUse, 145
Tang::AstNodeWhile, 150
Tang::ComputedExpression, 160
Tang::ComputedExpressionArray, 175
Tang::ComputedExpressionBoolean, 188
Tang::ComputedExpressionCompiledFunction, 201
Tang::ComputedExpressionError, 214
Tang::ComputedExpressionFloat, 228
Tang::ComputedExpressionInteger, 242
Tang::ComputedExpressionIterator, 256
Tang::ComputedExpressionIteratorEnd, 270
Tang::ComputedExpressionLibrary, 284
Tang::ComputedExpressionLibraryBase, 298
Tang::ComputedExpressionMap, 312
Tang::ComputedExpressionNativeBoundFunction, 328
Tang::ComputedExpressionNativeFunction, 342
Tang::ComputedExpressionNativeLibraryFunction, 358
Tang::ComputedExpressionString, 374
DUMPBINAR Y
program-dumpBytecode.cpp, 545
DUMPBINAR Y_I
program-dumpBytecode.cpp, 545
DUMPBINAR Y_II
program-dumpBytecode.cpp, 546
dumpBytecode
Tang::Program, 414
DUMPPROGRAMCHECK
program-analyze.cpp, 544
program-dumpBytecode.cpp, 546

EQ_II
opcode.hpp, 499
EQ_IS
opcode.hpp, 499
EQ_SI
opcode.hpp, 499
EQ_SS
opcode.hpp, 499
Equal
Tang::AstNodeBinary, 32
Error
Tang::Error, 382
error.cpp
operator<<, 541

execute
Tang::Program, 415
EXECUTEPROGRAMCHECK
program-execute.cpp, 549

FLOAT
opcode.hpp, 498

Float
Tang::AstNodeCast, 50

FUNCTION
opcode.hpp, 498

functionsDeclared
Tang::Program, 420

GarbageCollected
Tang::GarbageCollected, 385, 386

garbageCollected.cpp
operator<<, 542

get
Tang::SingletonObjectPool< T >, 422

get_next_token
Tang::HtmlEscape, 401
Tang::HtmlEscapeAscii, 403
Tang::PercentEncode, 406
Tang::TangScanner, 430
Tang::Unescape, 432

getAnnotations
Tang::Program, 416

getArgc
Tang::ComputedExpressionNativeBoundFunction, 328
Tang::ComputedExpressionNativeFunction, 342

getAst
Tang::Program, 416

getBytecode
Tang::Program, 416

getCode
Tang::Program, 416

getCollection
Tang::AstNodeIndex, 90

getContents
Tang::ComputedExpressionArray, 175

getFunction
Tang::ComputedExpressionNativeBoundFunction, 328
Tang::ComputedExpressionNativeFunction, 342
Tang::ComputedExpressionNativeLibraryFunction, 358

getIdentifiers
Tang::Program, 416

getIdentifiersAssigned
Tang::Program, 417

getIndex
Tang::AstNodeIndex, 90

getInstance
Tang::SingletonObjectPool< T >, 422

GETITERATOR_II
opcode.hpp, 499

GETITERATOR_SI

opcode.hpp, 499
 getLibraryAliases
 Tang::Program, 417
 getMethods
 Tang::ComputedExpressionArray, 175
 Tang::ComputedExpressionString, 375
 getResult
 Tang::Program, 417
 getStrings
 Tang::Program, 417
 getTargetTypeIndex
 Tang::ComputedExpressionNativeBoundFunction,
 328
 getType
 Tang::AstNodeString, 130
 getVal
 Tang::AstNodeString, 130
 getValue
 Tang::ComputedExpressionFloat, 228
 Tang::ComputedExpressionInteger, 242
 Tang::ComputedExpressionString, 375
 GreaterThan
 Tang::AstNodeBinary, 32
 GreaterThanEqual
 Tang::AstNodeBinary, 32
 GT_II
 opcode.hpp, 499
 GT_IS
 opcode.hpp, 499
 GT_SI
 opcode.hpp, 499
 GT_SS
 opcode.hpp, 499
 GTE_II
 opcode.hpp, 499
 GTE_IS
 opcode.hpp, 499
 GTE_SI
 opcode.hpp, 499
 GTE_SS
 opcode.hpp, 499
 HtmlEscape
 Tang::HtmlEscape, 400
 htmlEscape
 unicodeString.hpp, 510
 HtmlEscapeAscii
 Tang::HtmlEscapeAscii, 402
 htmlEscapeAscii
 unicodeString.hpp, 510

 include/astNode.hpp, 443
 include/astNodeArray.hpp, 444
 include/astNodeAssign.hpp, 445
 include/astNodeBinary.hpp, 446
 include/astNodeBlock.hpp, 447
 include/astNodeBoolean.hpp, 448
 include/astNodeBreak.hpp, 449
 include/astNodeCast.hpp, 450

 include/astNodeContinue.hpp, 451
 include/astNodeDoWhile.hpp, 452
 include/astNodeFloat.hpp, 453
 include/astNodeFor.hpp, 454
 include/astNodeFunctionCall.hpp, 455
 include/astNodeFunctionDeclaration.hpp, 456
 include/astNodeIdentifier.hpp, 457
 include/astNodeIfElse.hpp, 458
 include/astNodeIndex.hpp, 459
 include/astNodeInteger.hpp, 459
 include/astNodeLibrary.hpp, 460
 include/astNodeMap.hpp, 461
 include/astNodePeriod.hpp, 463
 include/astNodePrint.hpp, 464
 include/astNodeRangedFor.hpp, 465
 include/astNodeReturn.hpp, 466
 include/astNodeSlice.hpp, 467
 include/astNodeString.hpp, 468
 include/astNodeTernary.hpp, 468
 include/astNodeUnary.hpp, 469
 include/astNodeUse.hpp, 470
 include/astNodeWhile.hpp, 471
 include/computedExpression.hpp, 472
 include/computedExpressionArray.hpp, 473
 include/computedExpressionBoolean.hpp, 474
 include/computedExpressionCompiledFunction.hpp,
 475
 include/computedExpressionError.hpp, 476
 include/computedExpressionFloat.hpp, 477
 include/computedExpressionInteger.hpp, 478
 include/computedExpressionIterator.hpp, 478
 include/computedExpressionIteratorEnd.hpp, 479
 include/computedExpressionLibrary.hpp, 480
 include/computedExpressionLibraryMath.hpp, 481
 include/computedExpressionLibraryTang.hpp, 483
 include/computedExpressionMap.hpp, 484
 include/computedExpressionNativeBoundFunction.hpp,
 485
 include/computedExpressionNativeFunction.hpp, 486
 include/computedExpressionNativeLibraryFunction.hpp,
 487
 include/computedExpressionString.hpp, 488
 include/context.hpp, 488
 include/error.hpp, 489
 include/garbageCollected.hpp, 490
 include/htmlEscape.hpp, 491
 include/htmlEscapeAscii.hpp, 492
 include/macros.hpp, 494
 include/opcode.hpp, 496
 include/percentEncode.hpp, 501
 include/program.hpp, 502
 include/singletonObjectPool.hpp, 503
 include/tang.hpp, 504
 include/tangBase.hpp, 505
 include/tangScanner.hpp, 506
 include/unescape.hpp, 508
 include/unicodeString.hpp, 509
 INDEX_II

opcode.hpp, 499
INDEX_IS
 opcode.hpp, 499
INDEX_SI
 opcode.hpp, 499
INDEX_SS
 opcode.hpp, 499
INTEGER
 opcode.hpp, 498
Integer
 Tang::AstNodeCast, 50
is_equal
 Tang::ComputedExpression, 160–162
 Tang::ComputedExpressionArray, 175–177
 Tang::ComputedExpressionBoolean, 188–190
 Tang::ComputedExpressionCompiledFunction, 201–203
 Tang::ComputedExpressionError, 214–216
 Tang::ComputedExpressionFloat, 228–230
 Tang::ComputedExpressionInteger, 242–244
 Tang::ComputedExpressionIterator, 256, 258, 259
 Tang::ComputedExpressionIteratorEnd, 270, 272, 273
 Tang::ComputedExpressionLibrary, 284, 286, 287
 Tang::ComputedExpressionLibraryBase, 298, 300, 301
 Tang::ComputedExpressionMap, 312–314
 Tang::ComputedExpressionNativeBoundFunction, 329–331
 Tang::ComputedExpressionNativeFunction, 343–345
 Tang::ComputedExpressionNativeLibraryFunction, 358–360
 Tang::ComputedExpressionString, 375–378
IsAssignment
 Tang::AstNode, 18
 Tang::AstNodeArray, 23
 Tang::AstNodeAssign, 27
 Tang::AstNodeBinary, 33
 Tang::AstNodeBlock, 37
 Tang::AstNodeBoolean, 41
 Tang::AstNodeBreak, 45
 Tang::AstNodeCast, 49
 Tang::AstNodeContinue, 53
 Tang::AstNodeDoWhile, 58
 Tang::AstNodeFloat, 62
 Tang::AstNodeFor, 66
 Tang::AstNodeFunctionCall, 70
 Tang::AstNodeFunctionDeclaration, 74
 Tang::AstNodeIdentifier, 78
 Tang::AstNodeElse, 83
 Tang::AstNodeIndex, 88
 Tang::AstNodeInteger, 93
 Tang::AstNodeLibrary, 97
 Tang::AstNodeMap, 101
 Tang::AstNodePeriod, 105
 Tang::AstNodePrint, 109
 Tang::AstNodeRangedFor, 113
Tang::AstNodeReturn, 118
Tang::AstNodeSlice, 122
Tang::AstNodeString, 127
Tang::AstNodeTernary, 133
Tang::AstNodeUnary, 138
Tang::AstNodeUse, 143
Tang::AstNodeWhile, 148
isCopyNeeded
 Tang::ComputedExpression, 162
 Tang::ComputedExpressionArray, 178
 Tang::ComputedExpressionBoolean, 190
 Tang::ComputedExpressionCompiledFunction, 203
 Tang::ComputedExpressionError, 216
 Tang::ComputedExpressionFloat, 230
 Tang::ComputedExpressionInteger, 245
 Tang::ComputedExpressionIterator, 259
 Tang::ComputedExpressionIteratorEnd, 273
 Tang::ComputedExpressionLibrary, 287
 Tang::ComputedExpressionLibraryBase, 301
 Tang::ComputedExpressionMap, 315
 Tang::ComputedExpressionNativeBoundFunction, 331
 Tang::ComputedExpressionNativeFunction, 346
 Tang::ComputedExpressionNativeLibraryFunction, 360
 Tang::ComputedExpressionString, 378
 Tang::GarbageCollected, 386
ISITERATOREND_I
 opcode.hpp, 500
ITERATORNEXT_II
 opcode.hpp, 499
JMP
 opcode.hpp, 498
JMPF_I
 opcode.hpp, 498
JMPF_POP
 opcode.hpp, 498
JMPT_S
 opcode.hpp, 498
JMPT_I
 opcode.hpp, 498
JMPT_POP
 opcode.hpp, 498
JMPT_S
 opcode.hpp, 498
length
 Tang::ComputedExpressionString, 378
 Tang::UnicodeString, 435
LessThan
 Tang::AstNodeBinary, 32
LessThanEqual
 Tang::AstNodeBinary, 32
LIBRARY
 opcode.hpp, 498
 tangBase.cpp, 553
LIBRARYCOPY
 opcode.hpp, 498

LIBRARYSAVE
 opcode.hpp, 498

location.hh
 operator<<, 442, 443

LOGICALOP
 astNodeBinary.cpp, 515

LT_II
 opcode.hpp, 499

LT_IS
 opcode.hpp, 499

LT_SI
 opcode.hpp, 499

LT_SS
 opcode.hpp, 499

LTE_II
 opcode.hpp, 499

LTE_IS
 opcode.hpp, 499

LTE_SI
 opcode.hpp, 499

LTE_SS
 opcode.hpp, 499

macros.hpp
 BINARYOP, 495
 OPCODE_FIND_INDEX, 495
 UNARYOP, 496

make
 Tang::GarbageCollected, 387

make_shared
 Tang::TangBase, 428

makeCopy
 Tang::ComputedExpression, 163
 Tang::ComputedExpressionArray, 178
 Tang::ComputedExpressionBoolean, 191
 Tang::ComputedExpressionCompiledFunction, 204
 Tang::ComputedExpressionError, 217
 Tang::ComputedExpressionFloat, 231
 Tang::ComputedExpressionInteger, 245
 Tang::ComputedExpressionIterator, 259
 Tang::ComputedExpressionIteratorEnd, 273
 Tang::ComputedExpressionLibrary, 287
 Tang::ComputedExpressionLibraryBase, 301
 Tang::ComputedExpressionMap, 315
 Tang::ComputedExpressionNativeBoundFunction,
 331
 Tang::ComputedExpressionNativeFunction, 346
 Tang::ComputedExpressionNativeLibraryFunction,
 361
 Tang::ComputedExpressionString, 379
 Tang::GarbageCollected, 387

MAP
 opcode.hpp, 498

Modulo
 Tang::AstNodeBinary, 32

MODULO_II
 opcode.hpp, 499

MODULO_IS
 opcode.hpp, 499

MODULO_SI
 opcode.hpp, 499

MODULO_SS
 opcode.hpp, 499

Multiply
 Tang::AstNodeBinary, 32

MULTIPLY_II
 opcode.hpp, 498

MULTIPLY_IS
 opcode.hpp, 498

MULTIPLY_SI
 opcode.hpp, 498

MULTIPLY_SS
 opcode.hpp, 498

Negative
 Tang::AstNodeUnary, 138

NEGATIVE_I
 opcode.hpp, 499

NEGATIVE_S
 opcode.hpp, 499

NEQ_II
 opcode.hpp, 499

NEQ_IS
 opcode.hpp, 499

NEQ_SI
 opcode.hpp, 499

NEQ_SS
 opcode.hpp, 499

Not
 Tang::AstNodeUnary, 138

NOT_I
 opcode.hpp, 499

NOT_S
 opcode.hpp, 499

NotEqual
 Tang::AstNodeBinary, 32

NULLVAL
 opcode.hpp, 498

Opcode
 opcode.hpp, 497

opcode.hpp
 ADD_II, 498
 ADD_IS, 498
 ADD_SI, 498
 ADD_SS, 498
 ARRAY, 498
 ASSIGNINDEX, 498
 BOOLEAN, 498
 CALLFUNC, 500
 CALLFUNC_I, 500
 CASTBOOLEAN_I, 500
 CASTBOOLEAN_S, 500
 CASTFLOAT_I, 500
 CASTFLOAT_S, 500
 CASTINTEGER_I, 500
 CASTINTEGER_S, 500
 CASTSTRING_I, 500

CASTSTRING_S, 500
COPY, 498
DIVIDE_II, 499
DIVIDE_IS, 499
DIVIDE_SI, 498
DIVIDE_SS, 498
EQ_II, 499
EQ_IS, 499
EQ_SI, 499
EQ_SS, 499
FLOAT, 498
FUNCTION, 498
GETITERATOR_II, 499
GETITERATOR_SI, 499
GT_II, 499
GT_IS, 499
GT_SI, 499
GT_SS, 499
GTE_II, 499
GTE_IS, 499
GTE_SI, 499
GTE_SS, 499
INDEX_II, 499
INDEX_IS, 499
INDEX_SI, 499
INDEX_SS, 499
INTEGER, 498
ISITERATOREND_I, 500
ITERATORNEXT_II, 499
JMP, 498
JMPF_I, 498
JMPF_POP, 498
JMPF_S, 498
JMPT_I, 498
JMPT_POP, 498
JMPT_S, 498
LIBRARY, 498
LIBRARYCOPY, 498
LIBRARYSAVE, 498
LT_II, 499
LT_IS, 499
LT_SI, 499
LT_SS, 499
LTE_II, 499
LTE_IS, 499
LTE_SI, 499
LTE_SS, 499
MAP, 498
MODULO_II, 499
MODULO_IS, 499
MODULO_SI, 499
MODULO_SS, 499
MULTIPLY_II, 498
MULTIPLY_IS, 498
MULTIPLY_SI, 498
MULTIPLY_SS, 498
NEGATIVE_I, 499
NEGATIVE_S, 499
NEQ_II, 499
NEQ_IS, 499
NEQ_SI, 499
NEQ_SS, 499
NOT_I, 499
NOT_S, 499
NULLVAL, 498
Opcode, 497
operator<<, 500
PEEK, 498
PERIOD_II, 499
PERIOD_IS, 499
PERIOD_SI, 499
PERIOD_SS, 499
POKE, 498
POP, 498
PRINT_I, 500
PRINT_S, 500
RETURN, 500
SLICE, 499
STRING, 498
SUBTRACT_II, 498
SUBTRACT_IS, 498
SUBTRACT_SI, 498
SUBTRACT_SS, 498
OPCODE_FIND_INDEX
 macros.hpp, 495
OpcodePositions
 program.hpp, 503
Operation
 Tang::AstNodeBinary, 32
Operator
 Tang::AstNodeUnary, 137
operator std::string
 Tang::UnicodeString, 435
operator!
 Tang::GarbageCollected, 388
operator!=
 Tang::GarbageCollected, 388
operator<
 Tang::GarbageCollected, 393
 Tang::UnicodeString, 436
operator<<
 error.cpp, 541
 garbageCollected.cpp, 542
 location.hh, 442, 443
 opcode.hpp, 500
 Tang::Error, 382
 Tang::GarbageCollected, 398
operator<=

 Tang::GarbageCollected, 393
operator>
 Tang::GarbageCollected, 397
operator>=
 Tang::GarbageCollected, 398
operator*
 Tang::GarbageCollected, 389, 390
operator+

Tang::GarbageCollected, 390
 Tang::UnicodeString, 436
operator+=
 Tang::ComputedExpressionString, 379
 Tang::UnicodeString, 436
operator-
 Tang::GarbageCollected, 391
operator->
 Tang::GarbageCollected, 392
operator/
 Tang::GarbageCollected, 392
operator=
 Tang::GarbageCollected, 394
operator==
 Tang::GarbageCollected, 394–397
 Tang::UnicodeString, 437
operator%
 Tang::GarbageCollected, 389
Or
 Tang::AstNodeBinary, 32
PEEK
 opcode.hpp, 498
Percent
 Tang::UnicodeString, 435
PercentEncode
 Tang::PercentEncode, 406
percentEncode
 unicodeString.hpp, 511
PERIOD_II
 opcode.hpp, 499
PERIOD_IS
 opcode.hpp, 499
PERIOD_SI
 opcode.hpp, 499
PERIOD_SS
 opcode.hpp, 499
POKE
 opcode.hpp, 498
POP
 opcode.hpp, 498
popBreakStack
 Tang::Program, 418
popContinueStack
 Tang::Program, 418
PreprocessState
 Tang::AstNode, 18
 Tang::AstNodeArray, 23
 Tang::AstNodeAssign, 27
 Tang::AstNodeBinary, 33
 Tang::AstNodeBlock, 37
 Tang::AstNodeBoolean, 41
 Tang::AstNodeBreak, 45
 Tang::AstNodeCast, 49
 Tang::AstNodeContinue, 53
 Tang::AstNodeDoWhile, 58
 Tang::AstNodeFloat, 62
 Tang::AstNodeFor, 66
 Tang::AstNodeFunctionCall, 70
Tang::AstNodeFunctionDeclaration, 74
Tang::AstNodeIdentifier, 78
Tang::AstNodeIfElse, 83
Tang::AstNodeIndex, 88
Tang::AstNodeInteger, 93
Tang::AstNodeLibrary, 97
Tang::AstNodeMap, 101
Tang::AstNodePeriod, 105
Tang::AstNodePrint, 109
Tang::AstNodeRangedFor, 113
Tang::AstNodeReturn, 118
Tang::AstNodeSlice, 122
Tang::AstNodeString, 127
Tang::AstNodeTernary, 133
Tang::AstNodeUnary, 138
Tang::AstNodeUse, 143
Tang::AstNodeWhile, 148
PRINT_I
 opcode.hpp, 500
PRINT_S
 opcode.hpp, 500
PRINTTOP_I
 program-execute.cpp, 549
PRINTTOP_S
 program-execute.cpp, 549
Program
 Tang::Program, 411, 412
program-analyze.cpp
 DUMPPROGRAMCHECK, 544
program-dumpBytecode.cpp
 DUMPBINARY, 545
 DUMPBINARY_I, 545
 DUMPBINARY_II, 546
 DUMPPROGRAMCHECK, 546
program-execute.cpp
 BINARYOP_II, 547
 BINARYOP_IS, 548
 BINARYOP_SI, 548
 BINARYOP_SS, 548
 CASTOP_I, 548
 CASTOP_S, 549
 EXECUTEPROGRAMCHECK, 549
 PRINTTOP_I, 549
 PRINTTOP_S, 549
 STACKCHECK, 550
 UNARYOP_I, 550
 UNARYOP_S, 550
program.hpp
 OpcodePositions, 503
pushEnvironment
 Tang::Program, 419
recycle
 Tang::SingletonObjectPool< T >, 423
render
 Tang::UnicodeString, 437
renderAscii
 Tang::UnicodeString, 438
RETURN

opcode.hpp, 500
Script
 Tang::Program, 411
setAnnotation
 Tang::Program, 419
setFunctionStackDeclaration
 Tang::Program, 420
setJumpTarget
 Tang::Program, 420
SLICE
 opcode.hpp, 499
src/astNode.cpp, 512
src/astNodeArray.cpp, 513
src/astNodeAssign.cpp, 514
src/astNodeBinary.cpp, 514
src/astNodeBlock.cpp, 515
src/astNodeBoolean.cpp, 516
src/astNodeBreak.cpp, 517
src/astNodeCast.cpp, 517
src/astNodeContinue.cpp, 518
src/astNodeDoWhile.cpp, 518
src/astNodeFloat.cpp, 519
src/astNodeFor.cpp, 519
src/astNodeFunctionCall.cpp, 520
src/astNodeFunctionDeclaration.cpp, 520
src/astNodeIdentifier.cpp, 521
src/astNodeIfElse.cpp, 521
src/astNodeIndex.cpp, 522
src/astNodeInteger.cpp, 522
src/astNodeLibrary.cpp, 523
src/astNodeMap.cpp, 523
src/astNodePeriod.cpp, 524
src/astNodePrint.cpp, 524
src/astNodeRangedFor.cpp, 525
src/astNodeReturn.cpp, 526
src/astNodeSlice.cpp, 526
src/astNodeString.cpp, 527
src/astNodeTernary.cpp, 527
src/astNodeUnary.cpp, 528
src/astNodeUse.cpp, 529
src/astNodeWhile.cpp, 529
src/computedExpression.cpp, 530
src/computedExpressionArray.cpp, 530
src/computedExpressionBoolean.cpp, 531
src/computedExpressionCompiledFunction.cpp, 532
src/computedExpressionError.cpp, 532
src/computedExpressionFloat.cpp, 533
src/computedExpressionInteger.cpp, 533
src/computedExpressionIterator.cpp, 534
src/computedExpressionIteratorEnd.cpp, 535
src/computedExpressionLibrary.cpp, 535
src/computedExpressionLibraryMath.cpp, 536
src/computedExpressionLibraryTang.cpp, 536
src/computedExpressionMap.cpp, 537
src/computedExpressionNativeBoundFunction.cpp, 538
src/computedExpressionNativeFunction.cpp, 538
src/computedExpressionNativeLibraryFunction.cpp, 539
src/computedExpressionString.cpp, 539
src/context.cpp, 540
src/error.cpp, 541
src/garbageCollected.cpp, 542
src/opcode.cpp, 543
src/program-analyze.cpp, 543
src/program-dumpBytecode.cpp, 545
src/program-execute.cpp, 546
src/program-optimize.cpp, 551
src/program.cpp, 551
src/tang.cpp, 552
src/tangBase.cpp, 552
src/unicodeString.cpp, 553
STACKCHECK
 program-execute.cpp, 550
STRING
 opcode.hpp, 498
String
 Tang::AstNodeCast, 50
substr
 Tang::UnicodeString, 438
Subtract
 Tang::AstNodeBinary, 32
SUBTRACT_II
 opcode.hpp, 498
SUBTRACT_IS
 opcode.hpp, 498
SUBTRACT_SI
 opcode.hpp, 498
SUBTRACT_SS
 opcode.hpp, 498
Tang::AstNode, 15
 AstNode, 18
 compile, 19
 compilePreprocess, 19
 Default, 18
 dump, 20
 IsAssignment, 18
 PreprocessState, 18
Tang::AstNodeArray, 21
 AstNodeArray, 23
 compile, 24
 compilePreprocess, 24
 Default, 23
 dump, 25
 IsAssignment, 23
 PreprocessState, 23
Tang::AstNodeAssign, 25
 AstNodeAssign, 27
 compile, 28
 compilePreprocess, 28
 Default, 27
 dump, 29
 IsAssignment, 27
 PreprocessState, 27
Tang::AstNodeBinary, 29
 Add, 32
 And, 32
 AstNodeBinary, 33

compile, 33
compilePreprocess, 34
Default, 33
Divide, 32
dump, 34
Equal, 32
GreaterThan, 32
GreaterThanOrEqualTo, 32
IsAssignment, 33
LessThan, 32
LessThanOrEqualTo, 32
Modulo, 32
Multiply, 32
NotEqual, 32
Operation, 32
Or, 32
PreprocessState, 33
Subtract, 32
Tang::AstNodeBlock, 35
AstNodeBlock, 37
compile, 38
compilePreprocess, 38
Default, 37
dump, 39
IsAssignment, 37
PreprocessState, 37
Tang::AstNodeBoolean, 39
AstNodeBoolean, 41
compile, 42
compilePreprocess, 42
Default, 41
dump, 43
IsAssignment, 41
PreprocessState, 41
Tang::AstNodeBreak, 43
AstNodeBreak, 45
compile, 45
compilePreprocess, 46
Default, 45
dump, 47
IsAssignment, 45
PreprocessState, 45
Tang::AstNodeCast, 47
AstNodeCast, 50
Boolean, 50
compile, 50
compilePreprocess, 50
Default, 49
dump, 51
Float, 50
Integer, 50
IsAssignment, 49
PreprocessState, 49
String, 50
Type, 49
Tang::AstNodeContinue, 51
AstNodeContinue, 53
compile, 54
compilePreprocess, 54
Default, 53
dump, 55
IsAssignment, 53
PreprocessState, 53
Tang::AstNodeDoWhile, 55
AstNodeDoWhile, 58
compile, 59
compilePreprocess, 59
Default, 58
dump, 60
IsAssignment, 58
PreprocessState, 58
Tang::AstNodeFloat, 60
AstNodeFloat, 62
compile, 63
compilePreprocess, 63
Default, 62
dump, 64
IsAssignment, 62
PreprocessState, 62
Tang::AstNodeFor, 64
AstNodeFor, 67
compile, 67
compilePreprocess, 68
Default, 66
dump, 68
IsAssignment, 66
PreprocessState, 66
Tang::AstNodeFunctionCall, 69
AstNodeFunctionCall, 71
compile, 71
compilePreprocess, 72
Default, 70
dump, 72
IsAssignment, 70
PreprocessState, 70
Tang::AstNodeFunctionDeclaration, 72
AstNodeFunctionDeclaration, 74
compile, 75
compilePreprocess, 75
Default, 74
dump, 76
IsAssignment, 74
PreprocessState, 74
Tang::AstNodeIdentifier, 76
AstNodeIdentifier, 79
compile, 79
compilePreprocess, 80
Default, 78
dump, 80
IsAssignment, 78
PreprocessState, 78
Tang::AstNodeIfElse, 81
AstNodeIfElse, 84
compile, 84
compilePreprocess, 85
Default, 83

dump, 85
IsAssignment, 83
PreprocessState, 83
Tang::AstNodeIndex, 86
AstNodeIndex, 88
compile, 89
compilePreprocess, 89
Default, 88
dump, 90
getCollection, 90
getIndex, 90
IsAssignment, 88
PreprocessState, 88
Tang::AstNodeInteger, 91
AstNodeInteger, 93
compile, 94
compilePreprocess, 94
Default, 93
dump, 95
IsAssignment, 93
PreprocessState, 93
Tang::AstNodeLibrary, 95
AstNodeLibrary, 97
compile, 98
compilePreprocess, 98
Default, 97
dump, 99
IsAssignment, 97
PreprocessState, 97
Tang::AstNodeMap, 99
AstNodeMap, 101
compile, 101
compilePreprocess, 102
Default, 101
dump, 103
IsAssignment, 101
PreprocessState, 101
Tang::AstNodePeriod, 103
AstNodePeriod, 105
compile, 106
compilePreprocess, 106
Default, 105
dump, 107
IsAssignment, 105
PreprocessState, 105
Tang::AstNodePrint, 107
AstNodePrint, 110
compile, 110
compilePreprocess, 110
Default, 109, 110
dump, 111
IsAssignment, 109
PreprocessState, 109
Type, 109
Tang::AstNodeRangedFor, 111
AstNodeRangedFor, 113
compile, 114
compilePreprocess, 114
Default, 113
dump, 115
IsAssignment, 113
PreprocessState, 113
Tang::AstNodeReturn, 116
AstNodeReturn, 118
compile, 119
compilePreprocess, 119
Default, 118
dump, 120
IsAssignment, 118
PreprocessState, 118
Tang::AstNodeSlice, 120
AstNodeSlice, 123
compile, 123
compilePreprocess, 124
Default, 122
dump, 124
IsAssignment, 122
PreprocessState, 122
Tang::AstNodeString, 125
AstNodeString, 127, 128
compile, 128
compileLiteral, 129
compilePreprocess, 129
Default, 127
dump, 130
getType, 130
getVal, 130
IsAssignment, 127
PreprocessState, 127
Tang::AstNodeTernary, 131
AstNodeTernary, 133
compile, 134
compilePreprocess, 134
Default, 133
dump, 135
IsAssignment, 133
PreprocessState, 133
Tang::AstNodeUnary, 135
AstNodeUnary, 138
compile, 138
compilePreprocess, 140
Default, 138
dump, 140
IsAssignment, 138
Negative, 138
Not, 138
Operator, 137
PreprocessState, 138
Tang::AstNodeUse, 141
AstNodeUse, 143
compile, 144
compilePreprocess, 144
Default, 143
dump, 145
IsAssignment, 143
PreprocessState, 143

Tang::AstNodeWhile, 145
 AstNodeWhile, 148
 compile, 149
 compilePreprocess, 149
 Default, 148
 dump, 150
 IsAssignment, 148
 PreprocessState, 148
 Tang::ComputedExpression, 150
 __add, 153
 __asCode, 153
 __assign_index, 153
 __boolean, 154
 __divide, 154
 __equal, 154
 __float, 155
 __getIterator, 155
 __index, 155
 __integer, 156
 __iteratorNext, 156
 __lessThan, 156
 __modulo, 157
 __multiply, 157
 __negative, 158
 __not, 158
 __period, 158
 __slice, 159
 __string, 159
 __subtract, 159
 dump, 160
 is_equal, 160–162
 isCopyNeeded, 162
 makeCopy, 163
 Tang::ComputedExpressionArray, 163
 __add, 166
 __asCode, 166
 __assign_index, 167
 __boolean, 167
 __divide, 168
 __equal, 168
 __float, 169
 __getIterator, 169
 __index, 169
 __integer, 170
 __iteratorNext, 170
 __lessThan, 170
 __modulo, 171
 __multiply, 171
 __negative, 172
 __not, 172
 __period, 172
 __slice, 173
 __string, 173
 __subtract, 174
 append, 174
 ComputedExpressionArray, 166
 dump, 175
 getContents, 175
 getMethods, 175
 is_equal, 175–177
 isCopyNeeded, 178
 makeCopy, 178
 Tang::ComputedExpressionBoolean, 179
 __add, 181
 __asCode, 181
 __assign_index, 182
 __boolean, 182
 __divide, 182
 __equal, 183
 __float, 183
 __getIterator, 183
 __index, 184
 __integer, 184
 __iteratorNext, 184
 __lessThan, 185
 __modulo, 185
 __multiply, 185
 __negative, 186
 __not, 186
 __period, 186
 __slice, 187
 __string, 187
 __subtract, 187
 ComputedExpressionBoolean, 181
 dump, 188
 is_equal, 188–190
 isCopyNeeded, 190
 makeCopy, 191
 Tang::ComputedExpressionCompiledFunction, 191
 __add, 194
 __asCode, 194
 __assign_index, 194
 __boolean, 195
 __divide, 195
 __equal, 196
 __float, 196
 __getIterator, 196
 __index, 197
 __integer, 197
 __iteratorNext, 197
 __lessThan, 198
 __modulo, 198
 __multiply, 198
 __negative, 199
 __not, 199
 __period, 199
 __slice, 200
 __string, 200
 __subtract, 200
 ComputedExpressionCompiledFunction, 193
 dump, 201
 is_equal, 201–203
 isCopyNeeded, 203
 makeCopy, 204
 Tang::ComputedExpressionError, 204
 __add, 207

__asCode, 207
 __assign_index, 208
 __boolean, 208
 __divide, 208
 __equal, 209
 __float, 209
 __getIterator, 209
 __index, 210
 __integer, 210
 __iteratorNext, 210
 __lessThan, 211
 __modulo, 211
 __multiply, 211
 __negative, 212
 __not, 212
 __period, 212
 __slice, 213
 __string, 213
 __subtract, 213
ComputedExpressionError, 207
 dump, 214
 is_equal, 214–216
 isCopyNeeded, 216
 makeCopy, 217
Tang::ComputedExpressionFloat, 217
 __add, 220
 __asCode, 220
 __assign_index, 220
 __boolean, 221
 __divide, 221
 __equal, 222
 __float, 222
 __getIterator, 223
 __index, 223
 __integer, 223
 __iteratorNext, 223
 __lessThan, 224
 __modulo, 224
 __multiply, 225
 __negative, 225
 __not, 225
 __period, 226
 __slice, 226
 __string, 227
 __subtract, 227
ComputedExpressionFloat, 219
 dump, 228
 getValue, 228
 is_equal, 228–230
 isCopyNeeded, 230
 makeCopy, 231
Tang::ComputedExpressionInteger, 231
 __add, 234
 __asCode, 234
 __assign_index, 234
 __boolean, 235
 __divide, 235
 __equal, 236
 __float, 236
 __getIterator, 237
 __index, 237
 __integer, 237
 __iteratorNext, 237
 __lessThan, 238
 __modulo, 238
 __multiply, 239
 __negative, 239
 __not, 240
 __period, 240
 __slice, 240
 __string, 241
 __subtract, 241
ComputedExpressionInteger, 233
 dump, 242
 getValue, 242
 is_equal, 242–244
 isCopyNeeded, 245
 makeCopy, 245
Tang::ComputedExpressionIterator, 246
 __add, 248
 __asCode, 249
 __assign_index, 249
 __boolean, 249
 __divide, 250
 __equal, 250
 __float, 251
 __getIterator, 251
 __index, 251
 __integer, 252
 __iteratorNext, 252
 __lessThan, 252
 __modulo, 253
 __multiply, 253
 __negative, 254
 __not, 254
 __period, 254
 __slice, 255
 __string, 255
 __subtract, 255
ComputedExpressionIterator, 248
 dump, 256
 is_equal, 256, 258, 259
 isCopyNeeded, 259
 makeCopy, 259
Tang::ComputedExpressionIteratorEnd, 260
 __add, 262
 __asCode, 263
 __assign_index, 263
 __boolean, 263
 __divide, 264
 __equal, 264
 __float, 265
 __getIterator, 265
 __index, 265
 __integer, 266
 __iteratorNext, 266

```

__lessThan, 266
__modulo, 267
__multiply, 267
__negative, 267
__not, 268
__period, 268
__slice, 268
__string, 269
__subtract, 269
dump, 270
is_equal, 270, 272, 273
isCopyNeeded, 273
makeCopy, 273
Tang::ComputedExpressionLibrary, 274
__add, 276
__asCode, 277
__assign_index, 277
__boolean, 277
__divide, 278
__equal, 278
__float, 279
__getIterator, 279
__index, 279
__integer, 280
__iteratorNext, 280
__lessThan, 280
__modulo, 281
__multiply, 281
__negative, 281
__not, 282
__period, 282
__slice, 282
__string, 283
__subtract, 283
dump, 284
is_equal, 284, 286, 287
isCopyNeeded, 287
makeCopy, 287
Tang::ComputedExpressionLibraryBase, 288
__add, 290
__asCode, 291
__assign_index, 291
__boolean, 291
__divide, 292
__equal, 292
__float, 293
__getIterator, 293
__index, 293
__integer, 294
__iteratorNext, 294
__lessThan, 294
__modulo, 295
__multiply, 295
__negative, 295
__not, 296
__period, 296
__slice, 296
__string, 297
__subtract, 297
dump, 298
is_equal, 298, 300, 301
isCopyNeeded, 301
makeCopy, 301
Tang::ComputedExpressionMap, 302
__add, 305
__asCode, 305
__assign_index, 305
__boolean, 306
__divide, 306
__equal, 307
__float, 307
__getIterator, 307
__index, 308
__integer, 308
__iteratorNext, 308
__lessThan, 309
__modulo, 309
__multiply, 310
__negative, 310
__not, 310
__period, 310
__slice, 311
__string, 311
__subtract, 312
ComputedExpressionMap, 305
dump, 312
is_equal, 312–314
isCopyNeeded, 315
makeCopy, 315
Tang::ComputedExpressionNativeBoundFunction, 316
__add, 319
__asCode, 320
__assign_index, 320
__boolean, 320
__divide, 321
__equal, 321
__float, 322
__getIterator, 322
__index, 322
__integer, 323
__iteratorNext, 323
__lessThan, 323
__modulo, 325
__multiply, 325
__negative, 325
__not, 326
__period, 326
__slice, 326
__string, 327
__subtract, 327
ComputedExpressionNativeBoundFunction, 318
dump, 328
getArgc, 328
getFunction, 328
getTargetTypeIndex, 328
is_equal, 329–331

```

isCopyNeeded, 331
makeCopy, 331
Tang::ComputedExpressionNativeFunction, 332
 __add, 334
 __asCode, 335
 __assign_index, 335
 __boolean, 336
 __divide, 336
 __equal, 336
 __float, 337
 __getIterator, 337
 __index, 338
 __integer, 338
 __iteratorNext, 338
 __lessThan, 339
 __modulo, 339
 __multiply, 339
 __negative, 340
 __not, 340
 __period, 340
 __slice, 341
 __string, 341
 __subtract, 341
ComputedExpressionNativeFunction, 334
dump, 342
getArgc, 342
getFunction, 342
is_equal, 343–345
isCopyNeeded, 346
makeCopy, 346
Tang::ComputedExpressionNativeLibraryFunction, 347
 __add, 349
 __asCode, 350
 __assign_index, 350
 __boolean, 350
 __divide, 351
 __equal, 351
 __float, 352
 __getIterator, 352
 __index, 352
 __integer, 353
 __iteratorNext, 353
 __lessThan, 353
 __modulo, 355
 __multiply, 355
 __negative, 355
 __not, 356
 __period, 356
 __slice, 356
 __string, 357
 __subtract, 357
ComputedExpressionNativeLibraryFunction, 349
dump, 358
getFunction, 358
is_equal, 358–360
isCopyNeeded, 360
makeCopy, 361
Tang::ComputedExpressionString, 361
 __add, 365
 __asCode, 365
 __assign_index, 366
 __boolean, 366
 __divide, 367
 __equal, 367
 __float, 368
 __getIterator, 368
 __index, 369
 __integer, 369
 __iteratorNext, 369
 __lessThan, 370
 __modulo, 371
 __multiply, 371
 __negative, 372
 __not, 372
 __period, 372
 __slice, 373
 __string, 374
 __subtract, 374
bytesLength, 374
ComputedExpressionString, 364
dump, 374
getMethods, 375
getValue, 375
is_equal, 375–378
isCopyNeeded, 378
length, 378
makeCopy, 379
operator+=, 379
Tang::Context, 380
Tang::Error, 381
 Error, 382
 operator<<, 382
Tang::GarbageCollected, 383
 ~GarbageCollected, 386
 GarbageCollected, 385, 386
 isCopyNeeded, 386
 make, 387
 makeCopy, 387
 operator!, 388
 operator!=, 388
 operator<, 393
 operator<<, 398
 operator<=, 393
 operator>, 397
 operator>=, 398
 operator*, 389, 390
 operator+, 390
 operator-, 391
 operator->, 392
 operator/, 392
 operator=, 394
 operator==, 394–397
 operator%, 389
Tang::HtmlEscape, 399
 get_next_token, 401
 HtmlEscape, 400

Tang::HtmlEscapeAscii, 401
 get_next_token, 403
 HtmlEscapeAscii, 402
 Tang::location, 403
 Tang::PercentEncode, 405
 get_next_token, 406
 PercentEncode, 406
 Tang::position, 407
 Tang::Program, 408
 addBreak, 412
 addBytecode, 413
 addContinue, 413
 addIdentifier, 413
 addIdentifierAssigned, 413
 addLibraryAlias, 414
 addString, 414
 CodeType, 411
 dumpBytecode, 414
 execute, 415
 functionsDeclared, 420
 getAnnotations, 416
 getAst, 416
 getBytecode, 416
 getCode, 416
 getIdentifiers, 416
 getIdentifiersAssigned, 417
 getLibraryAliases, 417
 getResult, 417
 getStrings, 417
 popBreakStack, 418
 popContinueStack, 418
 Program, 411, 412
 pushEnvironment, 419
 Script, 411
 setAnnotation, 419
 setFunctionStackDeclaration, 420
 setJumpTarget, 420
 Template, 411
 Tang::SingletonObjectPool< T >, 421
 currentIndex, 423
 currentRecycledIndex, 423
 get, 422
 getInstance, 422
 recycle, 423
 Tang::TangBase, 424
 compileScript, 425, 426
 compileTemplate, 426
 make_shared, 428
 TangBase, 425
 Tang::TangScanner, 428
 get_next_token, 430
 TangScanner, 430
 Tang::Unescape, 431
 get_next_token, 432
 Unescape, 432
 Tang::UnicodeString, 433
 bytesLength, 435
 length, 435
 operator std::string, 435
 operator<, 436
 operator+, 436
 operator+=, 436
 operator==, 437
 Percent, 435
 render, 437
 renderAscii, 438
 substr, 438
 Trusted, 435
 Type, 434
 Untrusted, 435
 TangBase
 Tang::TangBase, 425
 tangBase.cpp
 LIBRARY, 553
 TangScanner
 Tang::TangScanner, 430
 Template
 Tang::Program, 411
 test/test.cpp, 554
 test/testGarbageCollected.cpp, 556
 test/testSingletonObjectPool.cpp, 557
 test/testUnicodeString.cpp, 557
 Trusted
 Tang::UnicodeString, 435
 Type
 Tang::AstNodeCast, 49
 Tang::AstNodePrint, 109
 Tang::UnicodeString, 434
 UNARYOP
 macros.hpp, 496
 UNARYOP_I
 program-execute.cpp, 550
 UNARYOP_S
 program-execute.cpp, 550
 Unescape
 Tang::Unescape, 432
 unescape
 unicodeString.hpp, 512
 unicodeString.hpp
 htmlEscape, 510
 htmlEscapeAscii, 510
 percentEncode, 511
 unescape, 512
 Untrusted
 Tang::UnicodeString, 435