

Tang

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# 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

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## Chapter 2

# Hierarchical Index

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

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# Class Index

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## Chapter 5

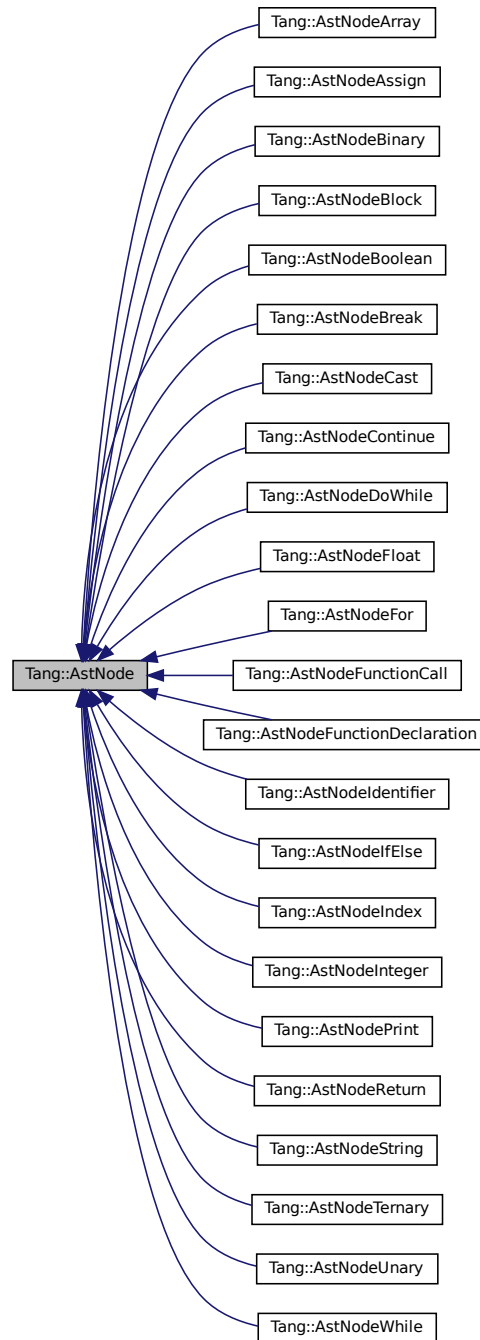
# Class Documentation

### 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:



## 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.*

### 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	<a href="#">AstNode</a> 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

<i>location</i>	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 <a href="#">Program</a> which will hold the generated Bytecode.
----------------	---

Reimplemented in [Tang::AstNodeWhile](#), [Tang::AstNodeUnary](#), [Tang::AstNodeTernary](#), [Tang::AstNodeString](#), [Tang::AstNodeReturn](#), [Tang::AstNodePrint](#), [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 <a href="#">Tang::Program</a> that is being compiled.
<i>state</i>	Any preprocess flags that need to be considered.

Reimplemented in [Tang::AstNodeWhile](#), [Tang::AstNodeUnary](#), [Tang::AstNodeTernary](#), [Tang::AstNodeString](#), [Tang::AstNodeReturn](#), [Tang::AstNodePrint](#), [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::AstNodeUnary](#), [Tang::AstNodeTernary](#), [Tang::AstNodeString](#), [Tang::AstNodeReturn](#), [Tang::AstNodePrint](#), [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:

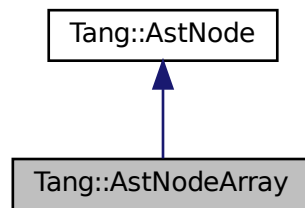
- [include/astNode.hpp](#)
- [src/astNode.cpp](#)

## 5.2 Tang::AstNodeArray Class Reference

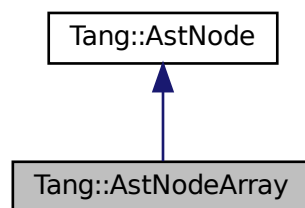
An [AstNode](#) that represents an array literal.

```
#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.*

### 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	<a href="#">AstNode</a> 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]
```

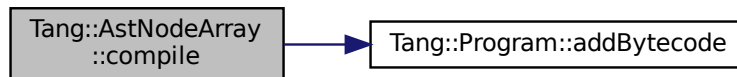
Compile the ast of the provided [Tang::Program](#).

## Parameters

<i>program</i>	The <a href="#">Program</a> 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 <a href="#">Tang::Program</a> 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:

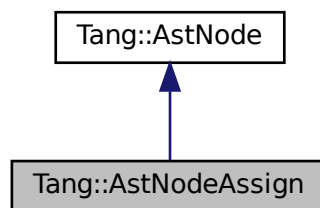
- include/[astNodeArray.hpp](#)
- src/[astNodeArray.cpp](#)

## 5.3 Tang::AstNodeAssign Class Reference

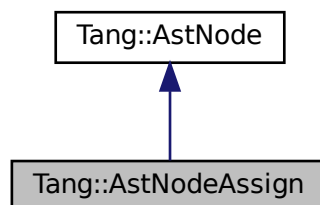
An [AstNode](#) that represents a binary expression.

```
#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.*

### 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	<a href="#">AstNode</a> 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]
```

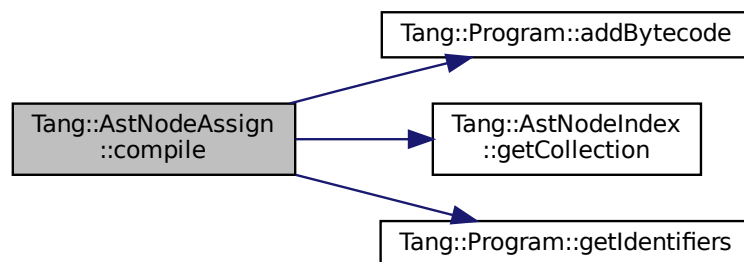
Compile the ast of the provided [Tang::Program](#).

##### Parameters

<i>program</i>	The <a href="#">Program</a> 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 <a href="#">Tang::Program</a> 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:

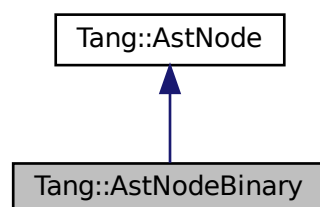
- [include/astNodeAssign.hpp](#)
- [src/astNodeAssign.cpp](#)

## 5.4 Tang::AstNodeBinary Class Reference

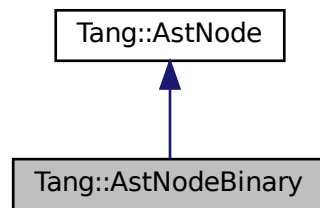
An [AstNode](#) that represents a binary expression.

```
#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](#) ,  
[GreaterThanEqual](#) , [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.*

### 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.
NotEqual	Indicates lhs != rhs.
And	Indicates lhs && rhs with short-circuit evaluation.
Or	Indicates lhs    rhs with short-circuit evaluation.

## 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	<a href="#">AstNode</a> is part of an assignment expression.

## 5.4.3 Constructor &amp; 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 <a href="#">Tang::AstNodeBinary::Operation</a> 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]
```

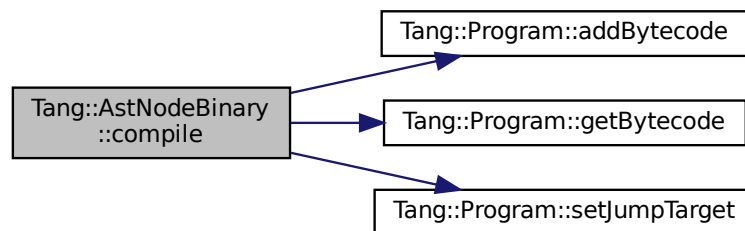
Compile the ast of the provided [Tang::Program](#).

#### Parameters

<i>program</i>	The <a href="#">Program</a> which will hold the generated Bytecode.
----------------	---

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

Here is the call graph for this function:



### 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 <a href="#">Tang::Program</a> 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:

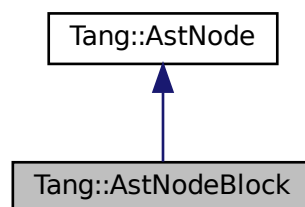
- [include/astNodeBinary.hpp](#)
- [src/astNodeBinary.cpp](#)

## 5.5 Tang::AstNodeBlock Class Reference

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

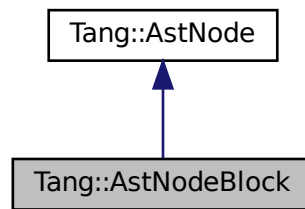
```
#include <astNodeBlock.hpp>
```

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.*

### 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	<a href="#">AstNode</a> 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]
```

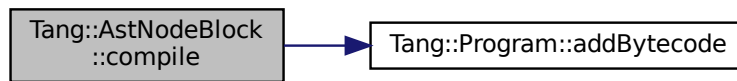
Compile the ast of the provided [Tang::Program](#).

## Parameters

<i>program</i>	The <a href="#">Program</a> 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 <a href="#">Tang::Program</a> 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:

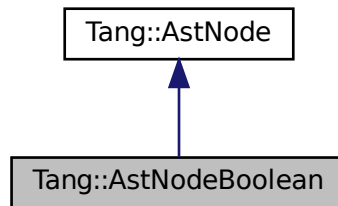
- [include/astNodeBlock.hpp](#)
- [src/astNodeBlock.cpp](#)

## 5.6 Tang::AstNodeBoolean Class Reference

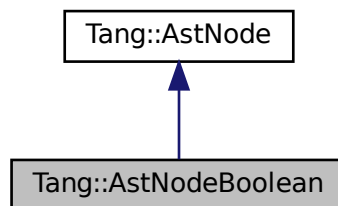
An [AstNode](#) that represents a boolean literal.

```
#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.*

## 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	<a href="#">AstNode</a> 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

<i>val</i>	The boolean to represent.
<i>location</i>	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]
```

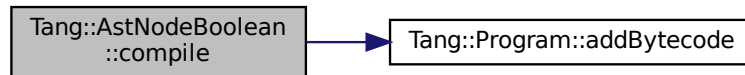
Compile the ast of the provided [Tang::Program](#).

## Parameters

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

Reimplemented in [Tang::AstNodeWhile](#), [Tang::AstNodeUnary](#), [Tang::AstNodeTernary](#), [Tang::AstNodeString](#), [Tang::AstNodeReturn](#), [Tang::AstNodePrint](#), [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:

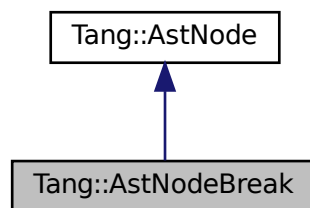
- include/[astNodeBoolean.hpp](#)
- src/[astNodeBoolean.cpp](#)

## 5.7 Tang::AstNodeBreak Class Reference

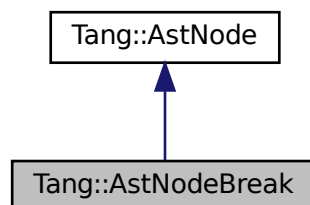
An [AstNode](#) that represents a `break` statement.

```
#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.*

### 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	<a href="#">AstNode</a> 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

<i>location</i>	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]
```

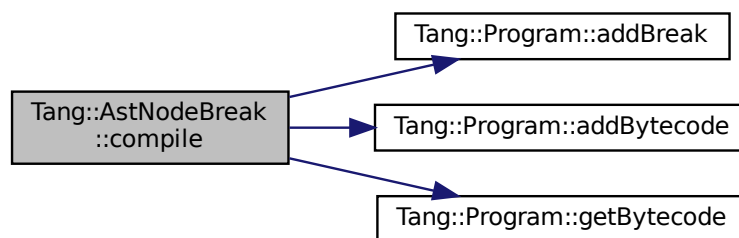
Compile the ast of the provided [Tang::Program](#).

#### Parameters

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

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

[Tang::AstNodeReturn](#), [Tang::AstNodePrint](#), [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:

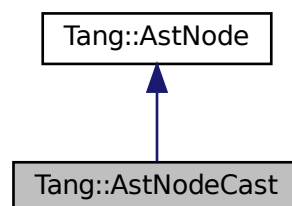
- [include/astNodeBreak.hpp](#)
- [src/astNodeBreak.cpp](#)

## 5.8 Tang::AstNodeCast Class Reference

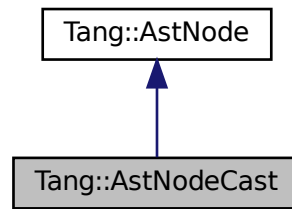
An [AstNode](#) that represents a typecast of an expression.

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

Inheritance diagram for Tang::AstNodeCast:



Collaboration diagram for Tang::AstNodeCast:



## Public Types

- enum [Type](#) { [Integer](#) , [Float](#) , [Boolean](#) }  
*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, 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.*

### 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	<a href="#">AstNode</a> 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 <a href="#">Tang::ComputedExpressionInteger</a> .
Float	Cast to a <a href="#">Tang::ComputedExpressionFloat</a> .
Boolean	Cast to a <a href="#">Tang::ComputedExpressionBoolean</a> .

## 5.8.3 Constructor &amp; Destructor Documentation

## 5.8.3.1 AstNodeCast()

```
AstNodeCast::AstNodeCast (
    Type targetType,
    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]
```

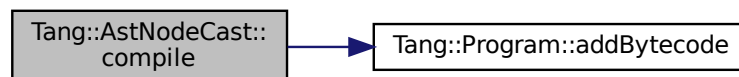
Compile the ast of the provided [Tang::Program](#).

#### Parameters

<i>program</i>	The <a href="#">Program</a> which will hold the generated Bytecode.
----------------	---

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

Here is the call graph for this function:



#### 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 <a href="#">Tang::Program</a> 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:

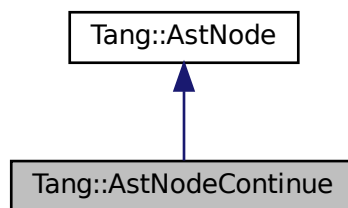
- include/[astNodeCast.hpp](#)
- src/[astNodeCast.cpp](#)

## 5.9 Tang::AstNodeContinue Class Reference

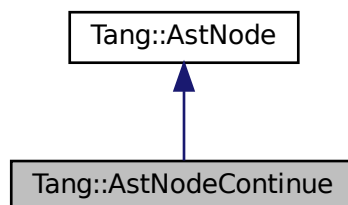
An [AstNode](#) that represents a `continue` statement.

```
#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.*

### 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

Default	The default state.
IsAssignment	<a href="#">AstNode</a> 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]
```

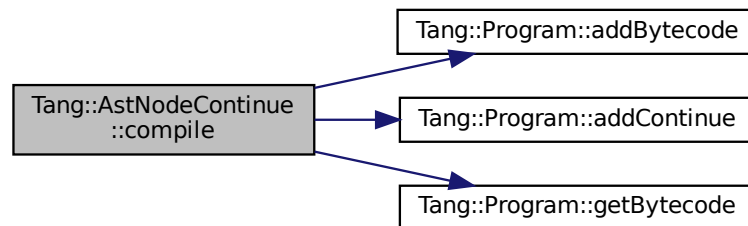
Compile the ast of the provided [Tang::Program](#).

#### Parameters

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

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

[Tang::AstNodeReturn](#), [Tang::AstNodePrint](#), [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:

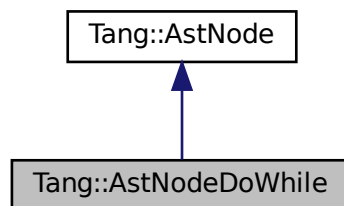
- [include/astNodeContinue.hpp](#)
- [src/astNodeContinue.cpp](#)

## 5.10 Tang::AstNodeDoWhile Class Reference

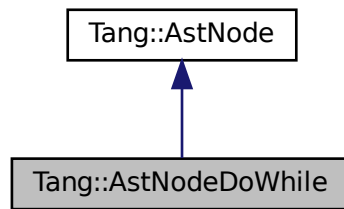
An [AstNode](#) that represents a do..while statement.

```
#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](#) (shared\_ptr< [AstNode](#) > condition, 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.*

### 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	<a href="#">AstNode</a> is part of an assignment expression.

### 5.10.3 Constructor & Destructor Documentation

#### 5.10.3.1 AstNodeDoWhile()

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

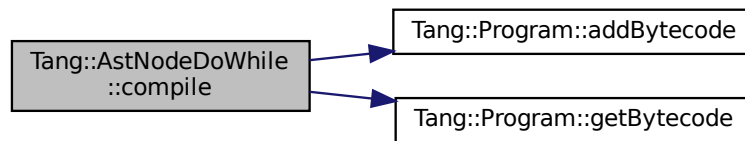
Compile the ast of the provided [Tang::Program](#).

## Parameters

<i>program</i>	The <a href="#">Program</a> 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 <a href="#">Tang::Program</a> 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:

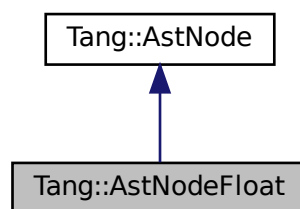
- [include/astNodeDoWhile.hpp](#)
- [src/astNodeDoWhile.cpp](#)

## 5.11 Tang::AstNodeFloat Class Reference

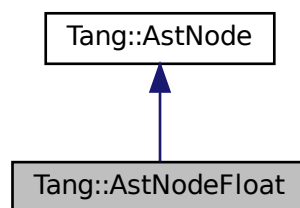
An [AstNode](#) that represents an float literal.

```
#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.*

### 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	<a href="#">AstNode</a> 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]
```

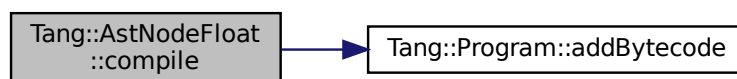
Compile the ast of the provided [Tang::Program](#).

## Parameters

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



Reimplemented in [Tang::AstNodeWhile](#), [Tang::AstNodeUnary](#), [Tang::AstNodeTernary](#), [Tang::AstNodeString](#), [Tang::AstNodeReturn](#), [Tang::AstNodePrint](#), [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:

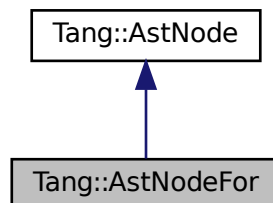
- [include/astNodeFloat.hpp](#)
- [src/astNodeFloat.cpp](#)

## 5.12 Tang::AstNodeFor Class Reference

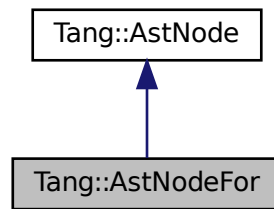
An [AstNode](#) that represents an if() statement.

```
#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](#) (shared\_ptr< [AstNode](#) > initialization, shared\_ptr< [AstNode](#) > condition, shared\_ptr< [AstNode](#) > increment, 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.*

### 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

Default	The default state.
IsAssignment	<a href="#">AstNode</a> is part of an assignment expression.

### 5.12.3 Constructor & Destructor Documentation

#### 5.12.3.1 AstNodeFor()

```
AstNodeFor::AstNodeFor (
    shared_ptr< AstNode > initialization,
    shared_ptr< AstNode > condition,
    shared_ptr< AstNode > increment,
    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]
```

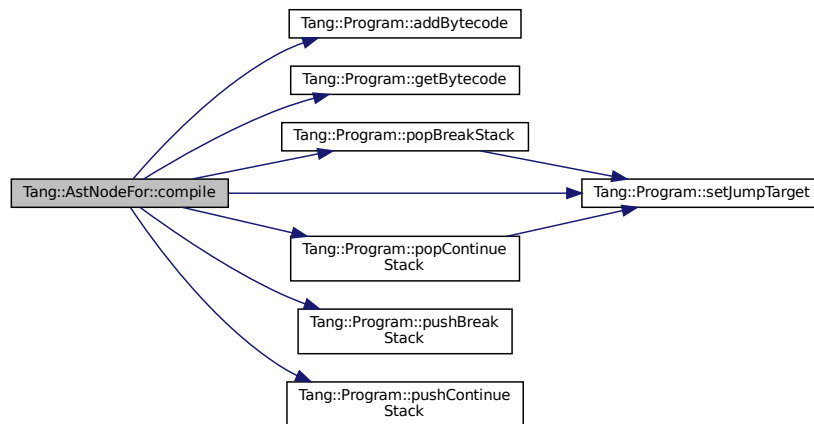
Compile the ast of the provided [Tang::Program](#).

## Parameters

<i>program</i>	The <a href="#">Program</a> 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 <a href="#">Tang::Program</a> 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:

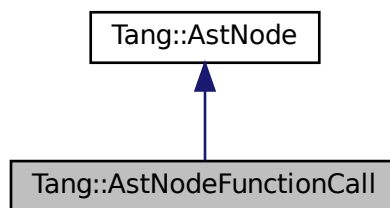
- [include/astNodeFor.hpp](#)
- [src/astNodeFor.cpp](#)

## 5.13 Tang::AstNodeFunctionCall Class Reference

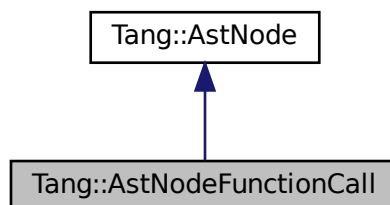
An [AstNode](#) that represents a function call.

```
#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.*

### 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	<a href="#">AstNode</a> 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 <a href="#">Program</a> 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 <a href="#">Tang::Program</a> 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:

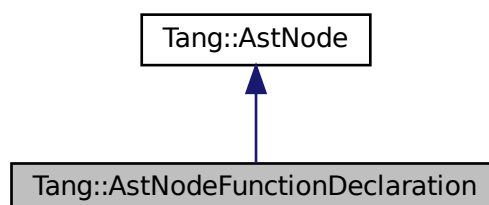
- [include/astNodeFunctionCall.hpp](#)
- [src/astNodeFunctionCall.cpp](#)

## 5.14 Tang::AstNodeFunctionDeclaration Class Reference

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

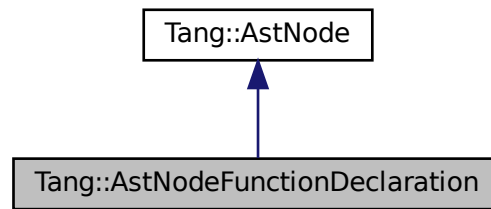
```
#include <astNodeFunctionDeclaration.hpp>
```

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, 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.*

### 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	<a href="#">AstNode</a> 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,
    shared_ptr< AstNode > codeBlock,
    Tang::location location )
```

The constructor.

## Parameters

<i>name</i>	The name of the function.
<i>arguments</i>	The arguments expected to be provided.
<i>codeBlock</i>	The code executed as part of the function.
<i>location</i>	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]
```

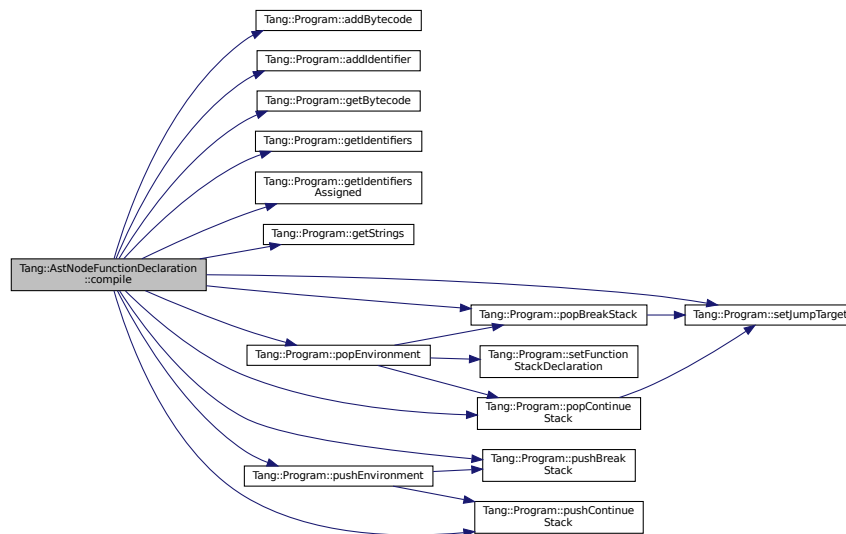
Compile the ast of the provided [Tang::Program](#).

## Parameters

<i>program</i>	The <a href="#">Program</a> 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]

```

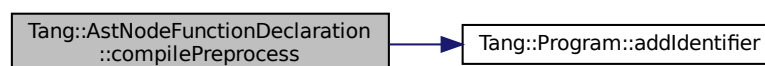
Run any preprocess analysis needed before compilation.

##### Parameters

<i>program</i>	The <a href="#">Tang::Program</a> 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:

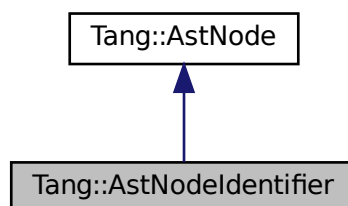
- [include/astNodeFunctionDeclaration.hpp](#)
- [src/astNodeFunctionDeclaration.cpp](#)

## 5.15 Tang::AstNodeIdentifier Class Reference

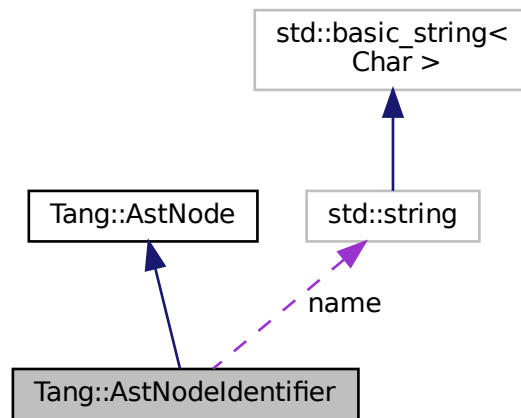
An [AstNode](#) that represents an identifier.

```
#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.*

### 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

Default	The default state.
IsAssignment	<a href="#">AstNode</a> 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]
```

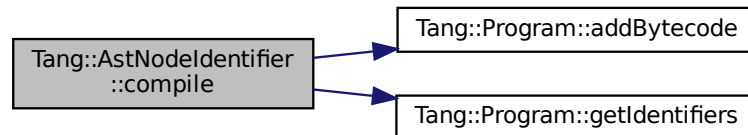
Compile the ast of the provided [Tang::Program](#).

## Parameters

<i>program</i>	The <a href="#">Program</a> 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]
  
```

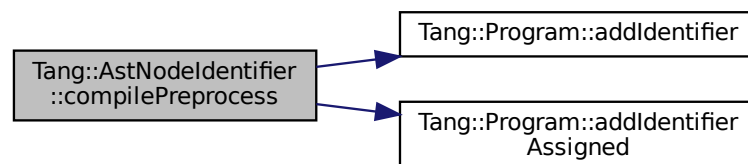
Run any preprocess analysis needed before compilation.

## Parameters

<i>program</i>	The <a href="#">Tang::Program</a> 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:

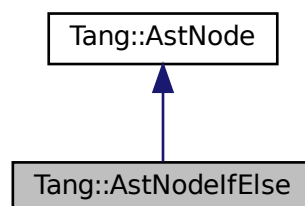
- include/[astNodeIdentifier.hpp](#)
- src/[astNodeIdentifier.cpp](#)

## 5.16 Tang::AstNodeIfElse Class Reference

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

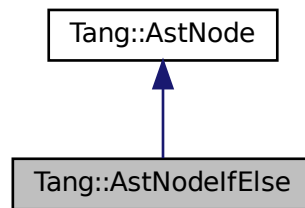
```
#include <astNodeIfElse.hpp>
```

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](#) (shared\_ptr< [AstNode](#) > condition, shared\_ptr< [AstNode](#) > thenBlock, shared\_ptr< [AstNode](#) > elseBlock, [Tang::location](#) location)
- The constructor.*
- [AstNodeIfElse](#) (shared\_ptr< [AstNode](#) > condition, 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.*

### 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	<a href="#">AstNode</a> is part of an assignment expression.

### 5.16.3 Constructor & Destructor Documentation

#### 5.16.3.1 AstNodeIfElse() [1/2]

```
AstNodeIfElse::AstNodeIfElse (
    shared_ptr< AstNode > condition,
    shared_ptr< AstNode > thenBlock,
    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 (
    shared_ptr< AstNode > condition,
    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]
```

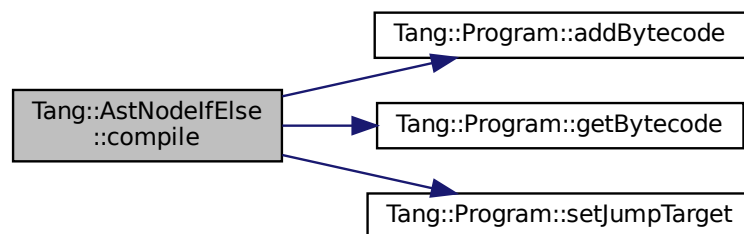
Compile the ast of the provided [Tang::Program](#).

#### Parameters

<i>program</i>	The <a href="#">Program</a> 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 <a href="#">Tang::Program</a> 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:

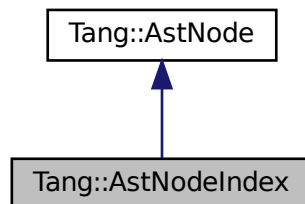
- [include/astNodeIfElse.hpp](#)
- [src/astNodeIfElse.cpp](#)

## 5.17 Tang::AstNodeIndex Class Reference

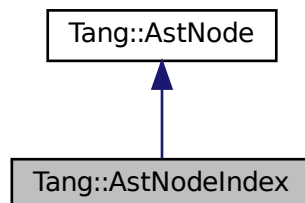
An [AstNode](#) that represents an index into a collection.

```
#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](#) 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.*

### 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	<a href="#">AstNode</a> 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]
```

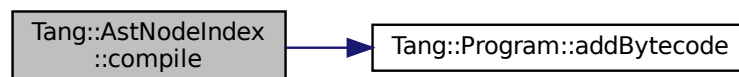
Compile the ast of the provided [Tang::Program](#).

#### Parameters

<i>program</i>	The <a href="#">Program</a> which will hold the generated Bytecode.
----------------	---

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

Here is the call graph for this function:



### 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 <a href="#">Tang::Program</a> 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:

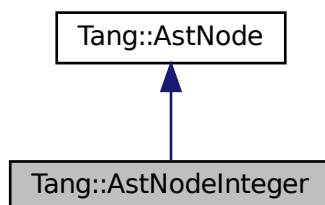
- [include/astNodeIndex.hpp](#)
- [src/astNodeIndex.cpp](#)

## 5.18 Tang::AstNodeInteger Class Reference

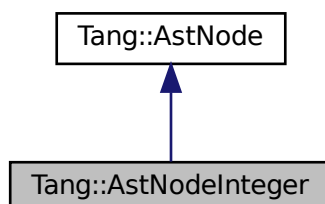
An [AstNode](#) that represents an integer literal.

```
#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.*

### 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

<a href="#">Default</a>	The default state.
<a href="#">IsAssignment</a>	<a href="#">AstNode</a> 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]
```

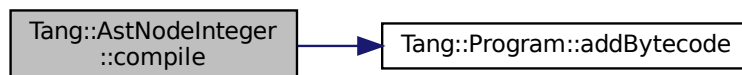
Compile the ast of the provided [Tang::Program](#).

#### Parameters

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

Reimplemented in [Tang::AstNodeWhile](#), [Tang::AstNodeUnary](#), [Tang::AstNodeTernary](#), [Tang::AstNodeString](#), [Tang::AstNodeReturn](#), [Tang::AstNodePrint](#), [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:

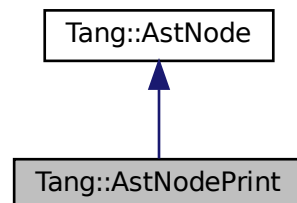
- [include/astNodeInteger.hpp](#)
- [src/astNodeInteger.cpp](#)

## 5.19 Tang::AstNodePrint Class Reference

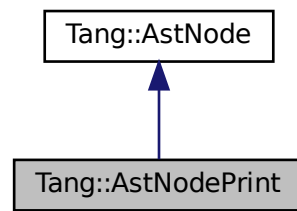
An [AstNode](#) that represents a print typeoperation.

```
#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, 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.*

### 5.19.1 Detailed Description

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

### 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	<a href="#">AstNode</a> is part of an assignment expression.

## 5.19.2.2 Type

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

The type of print() requested.

## Enumerator

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

## 5.19.3 Constructor &amp; Destructor Documentation

## 5.19.3.1 AstNodePrint()

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

The constructor.

## Parameters

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

## 5.19.4 Member Function Documentation

## 5.19.4.1 compile()

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

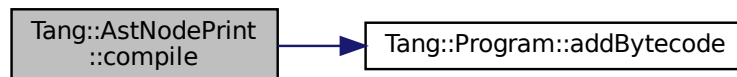
Compile the ast of the provided [Tang::Program](#).

## Parameters

<i>program</i>	The <a href="#">Program</a> which will hold the generated Bytecode.
----------------	---

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

Here is the call graph for this function:



#### 5.19.4.2 compilePreprocess()

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

Run any preprocess analysis needed before compilation.

## Parameters

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

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

#### 5.19.4.3 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:

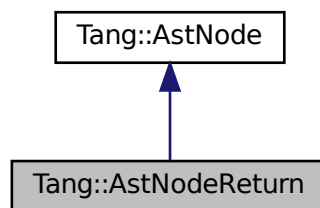
- include/[astNodePrint.hpp](#)
- src/[astNodePrint.cpp](#)

## 5.20 Tang::AstNodeReturn Class Reference

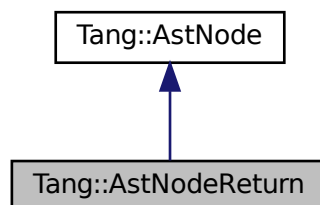
An [AstNode](#) that represents a `return` statement.

```
#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](#) ([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.*

### 5.20.1 Detailed Description

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

### 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	<a href="#">AstNode</a> is part of an assignment expression.

### 5.20.3 Constructor & Destructor Documentation

#### 5.20.3.1 AstNodeReturn()

```
AstNodeReturn::AstNodeReturn (
    shared\_ptr< AstNode > expression,
    Tang::location location )
```

The constructor.

##### Parameters

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



## 5.20.4 Member Function Documentation

### 5.20.4.1 compile()

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

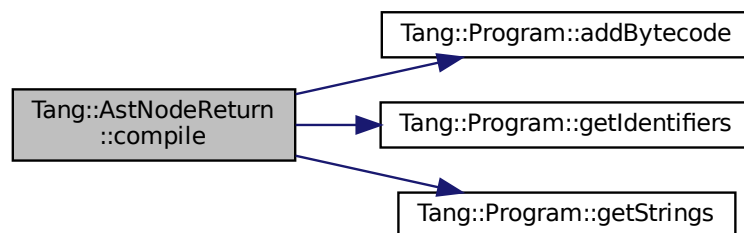
Compile the ast of the provided [Tang::Program](#).

#### Parameters

<i>program</i>	The <a href="#">Program</a> which will hold the generated Bytecode.
----------------	---

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

Here is the call graph for this function:



### 5.20.4.2 compilePreprocess()

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

Run any preprocess analysis needed before compilation.

#### Parameters

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

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

### 5.20.4.3 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:

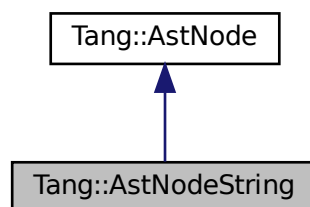
- [include/astNodeReturn.hpp](#)
- [src/astNodeReturn.cpp](#)

## 5.21 Tang::AstNodeString Class Reference

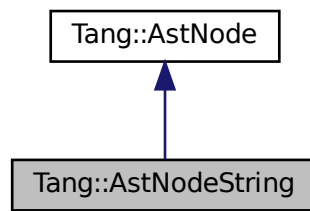
An [AstNode](#) that represents a string literal.

```
#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 string &text, [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.*
- void [compileLiteral](#) ([Tang::Program](#) &program) const  
*Compile the string and push it onto the stack.*

### 5.21.1 Detailed Description

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

### 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	<a href="#">AstNode</a> is part of an assignment expression.

### 5.21.3 Constructor & Destructor Documentation

#### 5.21.3.1 AstNodeString()

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

The constructor.

## Parameters

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

### 5.21.4 Member Function Documentation

#### 5.21.4.1 compile()

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

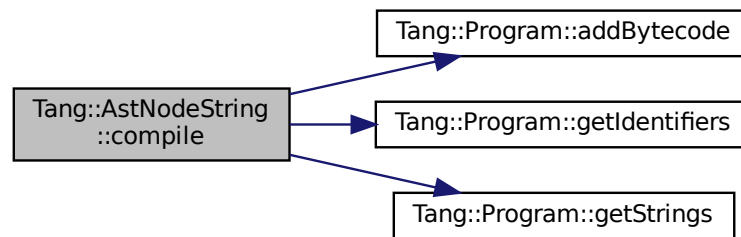
Compile the ast of the provided [Tang::Program](#).

## Parameters

<i>program</i>	The <a href="#">Program</a> which will hold the generated Bytecode.
----------------	---

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

Here is the call graph for this function:



#### 5.21.4.2 compileLiteral()

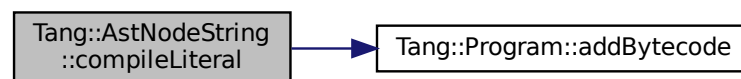
```
void AstNodeString::compileLiteral (
    Tang::Program & program ) const
```

Compile the string and push it onto the stack.

##### Parameters

<i>program</i>	The <a href="#">Program</a> which will hold the generated Bytecode.
----------------	---

Here is the call graph for this function:



#### 5.21.4.3 compilePreprocess()

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

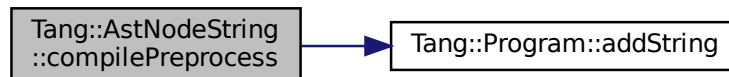
Run any preprocess analysis needed before compilation.

## Parameters

<i>program</i>	The <a href="#">Tang::Program</a> 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:



#### 5.21.4.4 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](#).

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

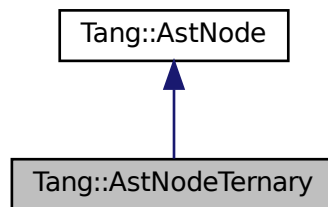
- include/[astNodeString.hpp](#)
- src/[astNodeString.cpp](#)

## 5.22 Tang::AstNodeTernary Class Reference

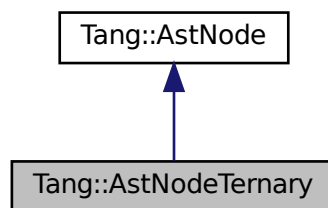
An [AstNode](#) that represents a ternary expression.

```
#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](#) (shared\_ptr< [AstNode](#) > condition, shared\_ptr< [AstNode](#) > trueExpression, 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.*

### 5.22.1 Detailed Description

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

### 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	<a href="#">AstNode</a> is part of an assignment expression.

### 5.22.3 Constructor & Destructor Documentation

#### 5.22.3.1 AstNodeTernary()

```
AstNodeTernary::AstNodeTernary (
    shared_ptr< AstNode > condition,
    shared_ptr< AstNode > trueExpression,
    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.

### 5.22.4 Member Function Documentation



### 5.22.4.1 compile()

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

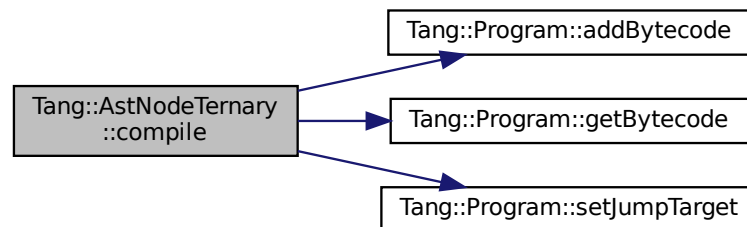
Compile the ast of the provided [Tang::Program](#).

#### Parameters

<i>program</i>	The <a href="#">Program</a> which will hold the generated Bytecode.
----------------	---

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

Here is the call graph for this function:



### 5.22.4.2 compilePreprocess()

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

Run any preprocess analysis needed before compilation.

#### Parameters

<i>program</i>	The <a href="#">Tang::Program</a> 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 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:

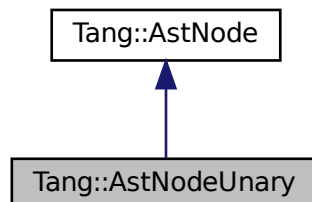
- [include/astNodeTernary.hpp](#)
- [src/astNodeTernary.cpp](#)

## 5.23 Tang::AstNodeUnary Class Reference

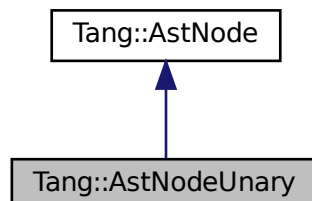
An [AstNode](#) that represents a unary negation.

```
#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, 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.*

### 5.23.1 Detailed Description

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

### 5.23.2 Member Enumeration Documentation

#### 5.23.2.1 Operator

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

The type of operation.

Enumerator

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

#### 5.23.2.2 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	<a href="#">AstNode</a> is part of an assignment expression.

### 5.23.3 Constructor & Destructor Documentation

#### 5.23.3.1 AstNodeUnary()

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

The constructor.

## Parameters

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

### 5.23.4 Member Function Documentation

#### 5.23.4.1 compile()

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

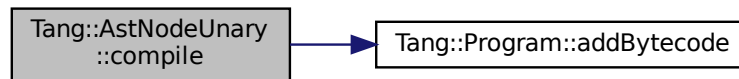
Compile the ast of the provided [Tang::Program](#).

## Parameters

<i>program</i>	The <a href="#">Program</a> which will hold the generated Bytecode.
----------------	---

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

Here is the call graph for this function:



#### 5.23.4.2 compilePreprocess()

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

Run any preprocess analysis needed before compilation.

##### Parameters

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

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

#### 5.23.4.3 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:

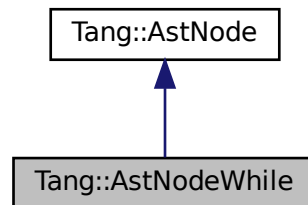
- [include/astNodeUnary.hpp](#)
- [src/astNodeUnary.cpp](#)

## 5.24 Tang::AstNodeWhile Class Reference

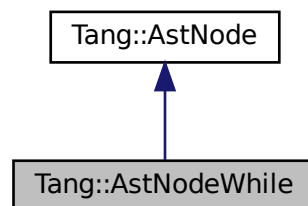
An [AstNode](#) that represents a while statement.

```
#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](#) (shared\_ptr< [AstNode](#) > condition, 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.*

### 5.24.1 Detailed Description

An [AstNode](#) that represents a while 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	<a href="#">AstNode</a> is part of an assignment expression.

### 5.24.3 Constructor & Destructor Documentation

#### 5.24.3.1 AstNodeWhile()

```
AstNodeWhile::AstNodeWhile (
    shared_ptr< AstNode > condition,
    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.

### 5.24.4 Member Function Documentation

#### 5.24.4.1 compile()

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

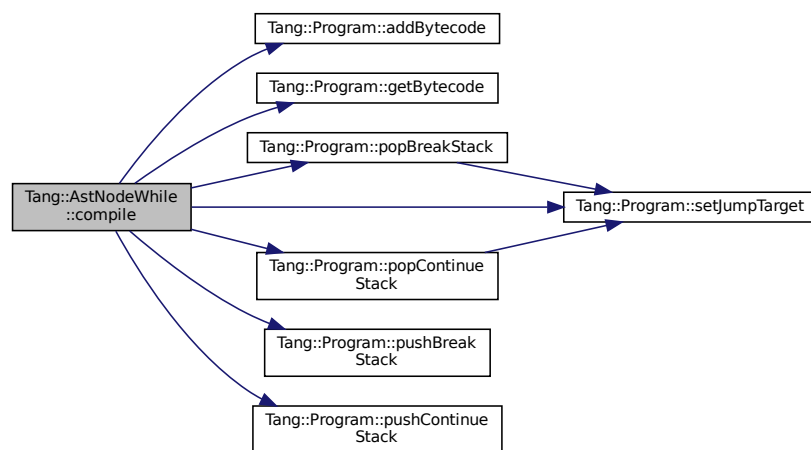
Compile the ast of the provided [Tang::Program](#).

##### Parameters

<i>program</i>	The <a href="#">Program</a> which will hold the generated Bytecode.
----------------	---

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

Here is the call graph for this function:



#### 5.24.4.2 compilePreprocess()

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

Run any preprocess analysis needed before compilation.

##### Parameters

<i>program</i>	The <a href="#">Tang::Program</a> 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 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:

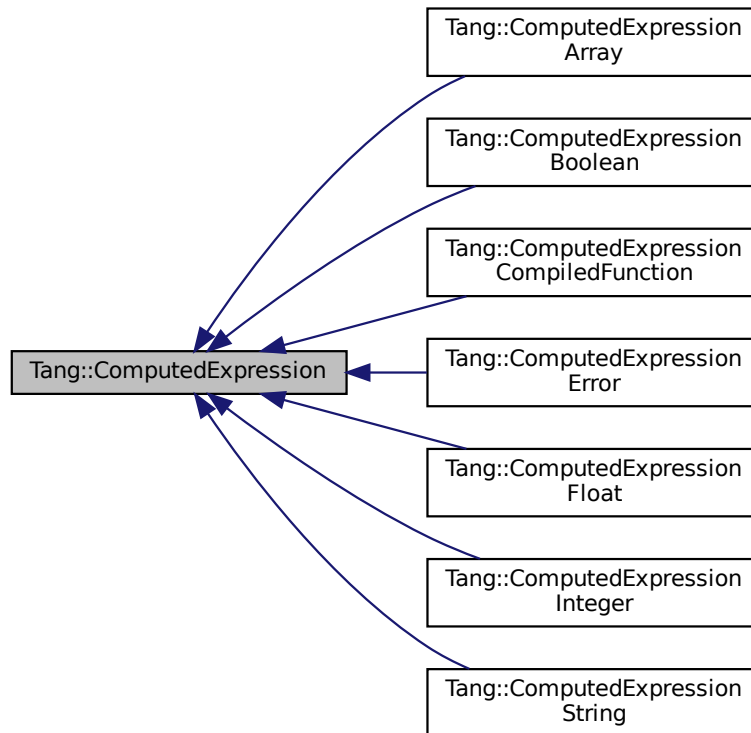
- [include/astNodeWhile.hpp](#)
- [src/astNodeWhile.cpp](#)

## 5.25 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 [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 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 __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.*

### 5.25.1 Detailed Description

Represents the result of a computation that has been executed.

By default, it will represent a NULL value.

### 5.25.2 Member Function Documentation

#### 5.25.2.1 \_\_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 <a href="#">GarbageCollected</a> value to add to this.
------------	--

## Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

**5.25.2.2 \_\_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::ComputedExpressionArray](#).

**5.25.2.3 \_\_boolean()**

```
GarbageCollected ComputedExpression::__boolean ( ) const [virtual]
```

Perform a type cast to boolean.

## Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

**5.25.2.4 \_\_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 <a href="#">GarbageCollected</a> value to divide this by.
------------	---

## Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

5.25.2.5 `__equal()`

```
GarbageCollected ComputedExpression::__equal (
    const GarbageCollected & rhs ) const [virtual]
```

Perform an equality test.

## Parameters

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to compare against.
------------	--

## Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), [Tang::ComputedExpressionCompiledFunction](#), and [Tang::ComputedExpressionBoolean](#).

5.25.2.6 `__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](#).

5.25.2.7 `__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::ComputedExpressionArray](#).

**5.25.2.8 `__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](#).

**5.25.2.9 `__lessThan()`**

```
GarbageCollected ComputedExpression::__lessThan (
    const GarbageCollected & rhs ) const [virtual]
```

Compute the "less than" comparison.

**Parameters**

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to compare against.
------------	--

**Returns**

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

#### 5.25.2.10 \_\_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 <a href="#">GarbageCollected</a> value to modulo this by.
------------	---

##### Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

#### 5.25.2.11 \_\_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 <a href="#">GarbageCollected</a> value to multiply to this.
------------	---

##### Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

#### 5.25.2.12 \_\_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](#).

**5.25.2.13 \_\_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](#).

**5.25.2.14 \_\_string()**

```
GarbageCollected ComputedExpression::__string ( ) const [virtual]
```

Perform a type cast to string.

**Returns**

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

**5.25.2.15 \_\_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 <a href="#">GarbageCollected</a> value to subtract from this.
------------	---

**Returns**

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).



### 5.25.2.16 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::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), [Tang::ComputedExpressionCompiledFunction](#), [Tang::ComputedExpressionBoolean](#), and [Tang::ComputedExpressionArray](#).

### 5.25.2.17 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](#).

### 5.25.2.18 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

<i>val</i>	The value to compare against.
------------	-------------------------------

**Returns**

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionError](#).

**5.25.2.19 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**

<i>val</i>	The value to compare against.
------------	-------------------------------

**Returns**

True if equal, false if not.

**5.25.2.20 is\_equal() [4/6]**

```
virtual bool Tang::ComputedExpression::is_equal (
    const string & 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](#).

**5.25.2.21 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

<i>val</i>	The value to compare against.
------------	-------------------------------

## Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

**5.25.2.22 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

<i>val</i>	The value to compare against.
------------	-------------------------------

## Returns

True if equal, false if not.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionFloat](#).

**5.25.2.23 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::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), [Tang::ComputedExpressionCompiledFunction](#), [Tang::ComputedExpressionBoolean](#), and [Tang::ComputedExpressionArray](#).

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

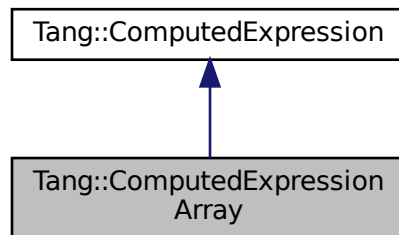
- [include/computedExpression.hpp](#)
- [src/computedExpression.cpp](#)

## 5.26 Tang::ComputedExpressionArray Class Reference

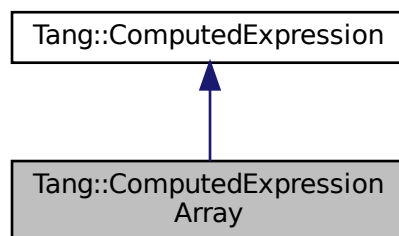
Represents an Array that is the result of a computation.

```
#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.*
- [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](#) [\\_\\_assign\\_index](#) (const [GarbageCollected](#) &index, const [GarbageCollected](#) &value) override

- Perform an index assignment to the supplied value.*
- 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 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` `__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.*

### 5.26.1 Detailed Description

Represents an Array that is the result of a computation.

### 5.26.2 Constructor & Destructor Documentation

### 5.26.2.1 ComputedExpressionArray()

```
ComputedExpressionArray::ComputedExpressionArray (
    std::vector< Tang::GarbageCollected > contents )
```

Construct an Array result.

## Parameters

<i>val</i>	The integer value.
------------	--------------------

### 5.26.3 Member Function Documentation

#### 5.26.3.1 \_\_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 <a href="#">GarbageCollected</a> value to add to this.
------------	--

## Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

#### 5.26.3.2 \_\_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](#).

### 5.26.3.3 `__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::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

### 5.26.3.4 `__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 <a href="#">GarbageCollected</a> value to divide this by.
------------	---

#### Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

### 5.26.3.5 `__equal()`

`GarbageCollected` `ComputedExpression::__equal (`  
`const GarbageCollected & rhs ) const [virtual], [inherited]`

Perform an equality test.

#### Parameters

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to compare against.
------------	--

#### Returns

The result of the the operation.



Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), [Tang::ComputedExpressionCompiledFunction](#), and [Tang::ComputedExpressionBoolean](#).

### 5.26.3.6 \_\_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](#).

### 5.26.3.7 \_\_index()

```
GarbageCollected ComputedExpressionArray::__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](#).

### 5.26.3.8 \_\_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](#).

### 5.26.3.9 `__lessThan()`

```
GarbageCollected ComputedExpression::__lessThan (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the "less than" comparison.

#### Parameters

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to compare against.
------------	--

#### Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

### 5.26.3.10 `__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 <a href="#">GarbageCollected</a> value to modulo this by.
------------	---

#### Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

### 5.26.3.11 `__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 <a href="#">GarbageCollected</a> value to multiply to this.
------------	---

**Returns**

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

**5.26.3.12 \_\_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](#).

**5.26.3.13 \_\_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](#).

**5.26.3.14 \_\_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::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

**5.26.3.15 \_\_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 <a href="#">GarbageCollected</a> value to subtract from this.
------------	---

**Returns**

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

**5.26.3.16 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](#).

**5.26.3.17 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](#).

### 5.26.3.18 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](#).

**5.26.3.19 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.

**5.26.3.20 is\_equal() [4/6]**

```
virtual bool Tang::ComputedExpression::is_equal (  
    const 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](#).

**5.26.3.21 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](#).

**5.26.3.22 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](#).

**5.26.3.23 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:

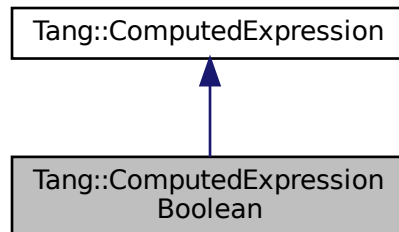
- [include/computedExpressionArray.hpp](#)
- [src/computedExpressionArray.cpp](#)

## 5.27 Tang::ComputedExpressionBoolean Class Reference

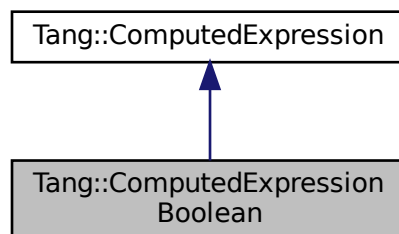
Represents an Boolean that is the result of a computation.

```
#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 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 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](#) `__index` (const [GarbageCollected](#) &index) const  
*Perform an index operation.*
- virtual [GarbageCollected](#) `__string` () const  
*Perform a type cast to string.*

### 5.27.1 Detailed Description

Represents an Boolean that is the result of a computation.

### 5.27.2 Constructor & Destructor Documentation

#### 5.27.2.1 ComputedExpressionBoolean()

```
ComputedExpressionBoolean::ComputedExpressionBoolean (
    bool val )
```

Construct an Boolean result.

## Parameters

<i>val</i>	The boolean value.
------------	--------------------

### 5.27.3 Member Function Documentation

#### 5.27.3.1 `__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 <a href="#">GarbageCollected</a> value to add to this.
------------	--

## Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

#### 5.27.3.2 `__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::ComputedExpressionArray](#).

### 5.27.3.3 \_\_boolean()

```
GarbageCollected ComputedExpressionBoolean::__boolean ( ) const [override], [virtual]
```

Perform a type cast to boolean.

#### Returns

The result of the the operation.

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

### 5.27.3.4 \_\_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 <a href="#">GarbageCollected</a> value to divide this by.
------------	---

#### Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

### 5.27.3.5 \_\_equal()

```
GarbageCollected ComputedExpressionBoolean::__equal (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Perform an equality test.

#### Parameters

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to compare against.
------------	--

#### Returns

The result of the the operation.

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

**5.27.3.6 \_\_float()**

`GarbageCollected ComputedExpressionBoolean::__float ( ) const [override], [virtual]`

Perform a type cast to float.

**Returns**

The result of the the operation.

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

**5.27.3.7 \_\_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::ComputedExpressionArray](#).

**5.27.3.8 \_\_integer()**

`GarbageCollected ComputedExpressionBoolean::__integer ( ) const [override], [virtual]`

Perform a type cast to integer.

**Returns**

The result of the the operation.

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

**5.27.3.9 \_\_lessThan()**

`GarbageCollected ComputedExpression::__lessThan (   
 const GarbageCollected & rhs ) const [virtual], [inherited]`

Compute the "less than" comparison.

## Parameters

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to compare against.
------------	--

## Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

## 5.27.3.10 \_\_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 <a href="#">GarbageCollected</a> value to modulo this by.
------------	---

## Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

## 5.27.3.11 \_\_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 <a href="#">GarbageCollected</a> value to multiply to this.
------------	---

## Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

### 5.27.3.12 `__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](#).

### 5.27.3.13 `__not()`

`GarbageCollected` `ComputedExpressionBoolean::__not ( ) const [override], [virtual]`

Compute the logical not of this value.

#### Returns

The result of the operation.

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

### 5.27.3.14 `__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::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

### 5.27.3.15 `__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 <a href="#">GarbageCollected</a> value to subtract from this.
------------	---

## Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

**5.27.3.16 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](#).

**5.27.3.17 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](#).

**5.27.3.18 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](#).

**5.27.3.19 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.

**5.27.3.20 is\_equal() [4/6]**

```
virtual bool Tang::ComputedExpression::is_equal (  
    const 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](#).



**5.27.3.21 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](#).

**5.27.3.22 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](#).

**5.27.3.23 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:

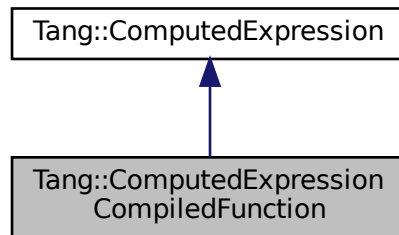
- include/computedExpressionBoolean.hpp
- src/computedExpressionBoolean.cpp

## 5.28 Tang::ComputedExpressionCompiledFunction Class Reference

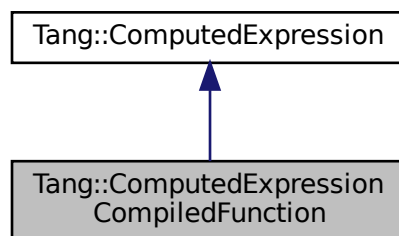
Represents a Compiled Function declared in the script.

```
#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 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 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](#) `__index (const GarbageCollected &index)` const  
*Perform an index 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.*
- virtual [GarbageCollected](#) `__string ()` const  
*Perform a type cast to string.*

### 5.28.1 Detailed Description

Represents a Compiled Function declared in the script.

### 5.28.2 Constructor & Destructor Documentation

### 5.28.2.1 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.

## 5.28.3 Member Function Documentation

### 5.28.3.1 \_\_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 <a href="#">GarbageCollected</a> value to add to this.
------------	--

#### Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

### 5.28.3.2 \_\_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::ComputedExpressionArray](#).

**5.28.3.3 \_\_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::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), [Tang::ComputedExpressionError](#), and [Tang::ComputedExpressionBoolean](#).

**5.28.3.4 \_\_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 <a href="#">GarbageCollected</a> value to divide this by.
------------	---

**Returns**

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

**5.28.3.5 \_\_equal()**

```
GarbageCollected ComputedExpressionCompiledFunction::__equal (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Perform an equality test.

#### Parameters

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to compare against.
------------	--

#### Returns

The result of the the operation.

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

#### 5.28.3.6 `__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](#).

#### 5.28.3.7 `__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::ComputedExpressionArray](#).

### 5.28.3.8 \_\_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](#).

### 5.28.3.9 \_\_lessThan()

```
GarbageCollected ComputedExpression::__lessThan (
    const GarbageCollected & rhs ) const [virtual], [inherited]
```

Compute the "less than" comparison.

#### Parameters

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to compare against.
------------	--

#### Returns

The result of the the operation.

Reimplemented in [Tang::ComputedExpressionString](#), [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

### 5.28.3.10 \_\_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 <a href="#">GarbageCollected</a> value to modulo this by.
------------	---

#### Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

### 5.28.3.11 `__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 <a href="#">GarbageCollected</a> value to multiply to this.
------------	---

#### Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

### 5.28.3.12 `__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](#).

### 5.28.3.13 `__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](#).



**5.28.3.14** `__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::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

**5.28.3.15** `__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 <a href="#">GarbageCollected</a> value to subtract from this.
------------	---

**Returns**

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

**5.28.3.16** `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](#).

**5.28.3.17** `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](#).

**5.28.3.18 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](#).

**5.28.3.19 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.

### 5.28.3.20 is\_equal() [4/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const 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](#).

### 5.28.3.21 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](#).

### 5.28.3.22 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](#).

**5.28.3.23 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:

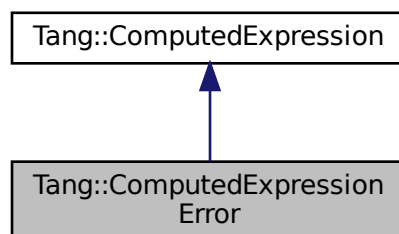
- [include/computedExpressionCompiledFunction.hpp](#)
- [src/computedExpressionCompiledFunction.cpp](#)

## 5.29 Tang::ComputedExpressionError Class Reference

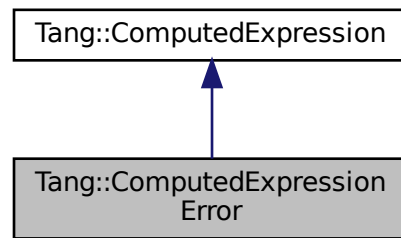
Represents a Runtime [Error](#).

```
#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  
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.*
- 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 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 __index (const GarbageCollected &index)` const  
*Perform an index operation.*

### 5.29.1 Detailed Description

Represents a Runtime `Error`.

### 5.29.2 Constructor & Destructor Documentation

#### 5.29.2.1 ComputedExpressionError()

```
ComputedExpressionError::ComputedExpressionError (
    Tang::Error error )
```

Construct a Runtime `Error`.

Parameters

<code>error</code>	The <code>Tang::Error</code> object.
--------------------	--------------------------------------

### 5.29.3 Member Function Documentation

#### 5.29.3.1 \_\_add()

```
GarbageCollected ComputedExpressionError::__add (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the result of adding this value and the supplied value.

## Parameters

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to add to this.
------------	--

## Returns

The result of the operation.

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

### 5.29.3.2 \_\_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::ComputedExpressionArray](#).

### 5.29.3.3 \_\_boolean()

```
GarbageCollected ComputedExpressionError::__boolean ( ) const [override], [virtual]
```

Perform a type cast to boolean.

## Returns

The result of the the operation.

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

### 5.29.3.4 \_\_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 <a href="#">GarbageCollected</a> value to divide this by.
------------	---

## Returns

The result of the operation.

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

**5.29.3.5** `__equal()`

```
GarbageCollected ComputedExpressionError::__equal (
    const GarbageCollected & rhs ) const  [override], [virtual]
```

Perform an equality test.

## Parameters

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to compare against.
------------	--

## Returns

The result of the the operation.

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

**5.29.3.6** `__float()`

```
GarbageCollected ComputedExpressionError::__float ( ) const  [override], [virtual]
```

Perform a type cast to float.

## Returns

The result of the the operation.

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

**5.29.3.7** `__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::ComputedExpressionArray](#).

**5.29.3.8 \_\_integer()**

```
GarbageCollected ComputedExpressionError::__integer ( ) const [override], [virtual]
```

Perform a type cast to integer.

## Returns

The result of the the operation.

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

**5.29.3.9 \_\_lessThan()**

```
GarbageCollected ComputedExpressionError::__lessThan (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the "less than" comparison.

## Parameters

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to compare against.
------------	--

## Returns

The result of the the operation.

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

**5.29.3.10 \_\_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 <a href="#">GarbageCollected</a> value to modulo this by.
------------	---

**Returns**

The result of the operation.

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

**5.29.3.11 `__multiply()`**

```
GarbageCollected ComputedExpressionError::__multiply (
    const GarbageCollected & rhs ) const  [override], [virtual]
```

Compute the result of multiplying this value and the supplied value.

**Parameters**

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to multiply to this.
------------	---

**Returns**

The result of the operation.

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

**5.29.3.12 `__negative()`**

```
GarbageCollected ComputedExpressionError::__negative ( ) const  [override], [virtual]
```

Compute the result of negating this value.

**Returns**

The result of the operation.

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

### 5.29.3.13 \_\_not()

`GarbageCollected` ComputedExpressionError::\_\_not ( ) const [override], [virtual]

Compute the logical not of this value.

#### Returns

The result of the operation.

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

### 5.29.3.14 \_\_string()

`GarbageCollected` ComputedExpressionError::\_\_string ( ) const [override], [virtual]

Perform a type cast to string.

#### Returns

The result of the the operation.

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

### 5.29.3.15 \_\_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](#).

### 5.29.3.16 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](#).

### 5.29.3.17 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](#).

### 5.29.3.18 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

<i>val</i>	The value to compare against.
------------	-------------------------------

#### Returns

True if equal, false if not.

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

#### 5.29.3.19 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.

#### 5.29.3.20 is\_equal() [4/6]

```
virtual bool Tang::ComputedExpression::is_equal (
    const 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](#).

#### 5.29.3.21 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](#).

**5.29.3.22 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](#).

**5.29.3.23 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:

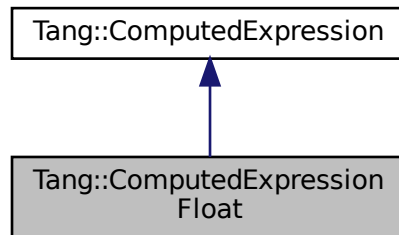
- [include/computedExpressionError.hpp](#)
- [src/computedExpressionError.cpp](#)

## 5.30 Tang::ComputedExpressionFloat Class Reference

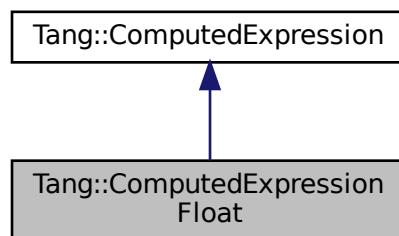
Represents a Float that is the result of a computation.

```
#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.*
- virtual bool `is_equal` (const 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 __index` (const `GarbageCollected` &index) const  
*Perform an index operation.*

## Friends

- class `ComputedExpressionInteger`

### 5.30.1 Detailed Description

Represents a Float that is the result of a computation.



## 5.30.2 Constructor & Destructor Documentation

### 5.30.2.1 ComputedExpressionFloat()

```
ComputedExpressionFloat::ComputedExpressionFloat (
    Tang::float_t val )
```

Construct a Float result.

#### Parameters

<i>val</i>	The float value.
------------	------------------

## 5.30.3 Member Function Documentation

### 5.30.3.1 \_\_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 <a href="#">GarbageCollected</a> value to add to this.
------------	--

#### Returns

The result of the operation.

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

### 5.30.3.2 \_\_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::ComputedExpressionArray](#).

**5.30.3.3 \_\_boolean()**

```
GarbageCollected ComputedExpressionFloat::__boolean ( ) const [override], [virtual]
```

Perform a type cast to boolean.

**Returns**

The result of the the operation.

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

**5.30.3.4 \_\_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 <a href="#">GarbageCollected</a> value to divide this by.
------------	---

**Returns**

The result of the operation.

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

### 5.30.3.5 \_\_equal()

```
GarbageCollected ComputedExpressionFloat::__equal (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Perform an equality test.

#### Parameters

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to compare against.
------------	--

#### Returns

The result of the the operation.

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

### 5.30.3.6 \_\_float()

```
GarbageCollected ComputedExpressionFloat::__float ( ) const [override], [virtual]
```

Perform a type cast to float.

#### Returns

The result of the the operation.

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

### 5.30.3.7 \_\_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::ComputedExpressionArray](#).

### 5.30.3.8 `__integer()`

`GarbageCollected` `ComputedExpressionFloat::__integer ( ) const [override], [virtual]`

Perform a type cast to integer.

#### Returns

The result of the the operation.

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

### 5.30.3.9 `__lessThan()`

`GarbageCollected` `ComputedExpressionFloat::__lessThan (`  
`const GarbageCollected & rhs ) const [override], [virtual]`

Compute the "less than" comparison.

#### Parameters

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to compare against.
------------	--

#### Returns

The result of the the operation.

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

### 5.30.3.10 `__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 <a href="#">GarbageCollected</a> value to modulo this by.
------------	---

#### Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

### 5.30.3.11 \_\_multiply()

```
GarbageCollected ComputedExpressionFloat::__multiply (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the result of multiplying this value and the supplied value.

#### Parameters

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to multiply to this.
------------	---

#### Returns

The result of the operation.

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

### 5.30.3.12 \_\_negative()

```
GarbageCollected ComputedExpressionFloat::__negative ( ) const [override], [virtual]
```

Compute the result of negating this value.

#### Returns

The result of the operation.

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

### 5.30.3.13 \_\_not()

```
GarbageCollected ComputedExpressionFloat::__not ( ) const [override], [virtual]
```

Compute the logical not of this value.

#### Returns

The result of the operation.

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

**5.30.3.14** `__string()`

```
GarbageCollected ComputedExpressionFloat::__string ( ) const [override], [virtual]
```

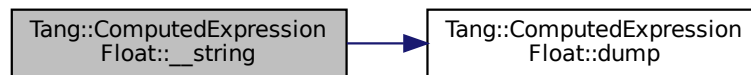
Perform a type cast to string.

**Returns**

The result of the the operation.

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

Here is the call graph for this function:

**5.30.3.15** `__subtract()`

```
GarbageCollected ComputedExpressionFloat::__subtract (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the result of subtracting this value and the supplied value.

**Parameters**

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to subtract from this.
------------	---

**Returns**

The result of the operation.

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

**5.30.3.16** `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](#).

**5.30.3.17 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**

<i>val</i>	The value to compare against.
------------	-------------------------------

**Returns**

True if equal, false if not.

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

**5.30.3.18 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](#).

**5.30.3.19 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.

**5.30.3.20 is\_equal() [4/6]**

```
virtual bool Tang::ComputedExpression::is_equal (  
    const 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](#).

**5.30.3.21 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](#).



**5.30.3.22 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](#).

**5.30.3.23 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:

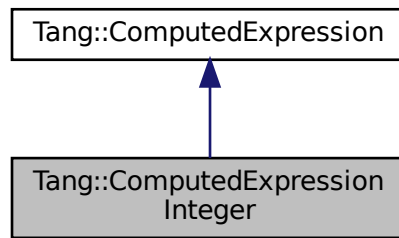
- include/[computedExpressionFloat.hpp](#)
- src/[computedExpressionFloat.cpp](#)

**5.31 Tang::ComputedExpressionInteger Class Reference**

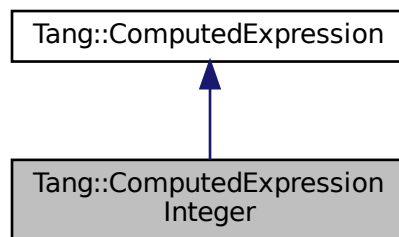
Represents an Integer that is the result of a computation.

```
#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.*
- virtual bool `is_equal` (const 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](#) `__index` (const [GarbageCollected](#) &index) const  
*Perform an index operation.*

## Friends

- class [ComputedExpressionFloat](#)
- class [ComputedExpressionArray](#)

### 5.31.1 Detailed Description

Represents an Integer that is the result of a computation.

### 5.31.2 Constructor & Destructor Documentation

#### 5.31.2.1 ComputedExpressionInteger()

```
ComputedExpressionInteger::ComputedExpressionInteger (
    Tang::integer_t val )
```

Construct an Integer result.

## Parameters

<i>val</i>	The integer value.
------------	--------------------

### 5.31.3 Member Function Documentation

#### 5.31.3.1 `__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 <a href="#">GarbageCollected</a> value to add to this.
------------	--

## Returns

The result of the operation.

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

#### 5.31.3.2 `__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::ComputedExpressionArray](#).

### 5.31.3.3 \_\_boolean()

```
GarbageCollected ComputedExpressionInteger::__boolean ( ) const [override], [virtual]
```

Perform a type cast to boolean.

#### Returns

The result of the the operation.

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

### 5.31.3.4 \_\_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 <a href="#">GarbageCollected</a> value to divide this by.
------------	---

#### Returns

The result of the operation.

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

### 5.31.3.5 \_\_equal()

```
GarbageCollected ComputedExpressionInteger::__equal (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Perform an equality test.

#### Parameters

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to compare against.
------------	--

#### Returns

The result of the the operation.

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

**5.31.3.6 \_\_float()**

`GarbageCollected` `ComputedExpressionInteger::__float ( ) const [override], [virtual]`

Perform a type cast to float.

**Returns**

The result of the the operation.

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

**5.31.3.7 \_\_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::ComputedExpressionArray](#).

**5.31.3.8 \_\_integer()**

`GarbageCollected` `ComputedExpressionInteger::__integer ( ) const [override], [virtual]`

Perform a type cast to integer.

**Returns**

The result of the the operation.

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

**5.31.3.9 \_\_lessThan()**

`GarbageCollected` `ComputedExpressionInteger::__lessThan (`  
`const GarbageCollected & rhs ) const [override], [virtual]`

Compute the "less than" comparison.

## Parameters

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to compare against.
------------	--

## Returns

The result of the the operation.

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

**5.31.3.10 \_\_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 <a href="#">GarbageCollected</a> value to modulo this by.
------------	---

## Returns

The result of the operation.

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

**5.31.3.11 \_\_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 <a href="#">GarbageCollected</a> value to multiply to this.
------------	---

## Returns

The result of the operation.

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

**5.31.3.12 \_\_negative()**

`GarbageCollected ComputedExpressionInteger::__negative ( ) const [override], [virtual]`

Compute the result of negating this value.

**Returns**

The result of the operation.

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

**5.31.3.13 \_\_not()**

`GarbageCollected ComputedExpressionInteger::__not ( ) const [override], [virtual]`

Compute the logical not of this value.

**Returns**

The result of the operation.

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

**5.31.3.14 \_\_string()**

`GarbageCollected ComputedExpressionInteger::__string ( ) const [override], [virtual]`

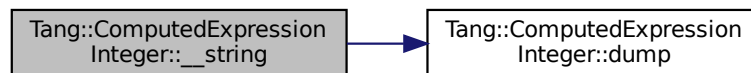
Perform a type cast to string.

**Returns**

The result of the the operation.

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

Here is the call graph for this function:

**5.31.3.15 \_\_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 <a href="#">GarbageCollected</a> value to subtract from this.
------------	---

## Returns

The result of the operation.

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

**5.31.3.16 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](#).

**5.31.3.17 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](#).

**5.31.3.18 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](#).

**5.31.3.19 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.

**5.31.3.20 is\_equal() [4/6]**

```
virtual bool Tang::ComputedExpression::is_equal (  
    const 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](#).

### 5.31.3.21 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

<i>val</i>	The value to compare against.
------------	-------------------------------

#### Returns

True if equal, false if not.

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

### 5.31.3.22 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

<i>val</i>	The value to compare against.
------------	-------------------------------

#### Returns

True if equal, false if not.

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

### 5.31.3.23 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:

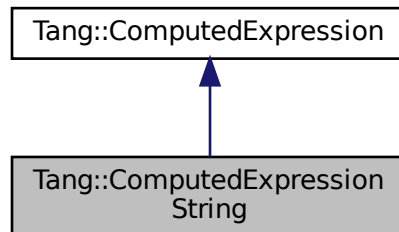
- include/computedExpressionInteger.hpp
- src/computedExpressionInteger.cpp

## 5.32 Tang::ComputedExpressionString Class Reference

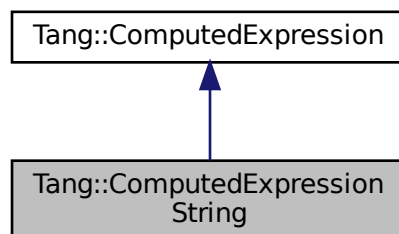
Represents a String that is the result of a computation.

```
#include <computedExpressionString.hpp>
```

Inheritance diagram for Tang::ComputedExpressionString:



Collaboration diagram for Tang::ComputedExpressionString:



### Public Member Functions

- [ComputedExpressionString](#) (std::string val)  
*Construct a String 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 bool [is\\_equal](#) (const string &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](#) [\\_\\_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.*
- 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](#) [\\_\\_index](#) (const [GarbageCollected](#) &index) const  
*Perform an index operation.*
- virtual [GarbageCollected](#) [\\_\\_integer](#) () const  
*Perform a type cast to integer.*
- virtual [GarbageCollected](#) [\\_\\_float](#) () const  
*Perform a type cast to float.*

### 5.32.1 Detailed Description

Represents a String that is the result of a computation.

### 5.32.2 Constructor & Destructor Documentation

#### 5.32.2.1 ComputedExpressionString()

```
ComputedExpressionString::ComputedExpressionString (
    std::string val )
```

Construct a String result.

## Parameters

<i>val</i>	The string value.
------------	-------------------

### 5.32.3 Member Function Documentation

#### 5.32.3.1 `__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 <a href="#">GarbageCollected</a> value to add to this.
------------	--

## Returns

The result of the operation.

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

#### 5.32.3.2 `__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::ComputedExpressionArray](#).

### 5.32.3.3 \_\_boolean()

```
GarbageCollected ComputedExpressionString::__boolean ( ) const [override], [virtual]
```

Perform a type cast to boolean.

#### Returns

The result of the the operation.

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

### 5.32.3.4 \_\_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 <a href="#">GarbageCollected</a> value to divide this by.
------------	---

#### Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

### 5.32.3.5 \_\_equal()

```
GarbageCollected ComputedExpressionString::__equal (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Perform an equality test.

#### Parameters

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to compare against.
------------	--

#### Returns

The result of the the operation.

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

### 5.32.3.6 `__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](#).

### 5.32.3.7 `__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::ComputedExpressionArray](#).

### 5.32.3.8 `__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](#).

### 5.32.3.9 `__lessThan()`

```
GarbageCollected ComputedExpressionString::__lessThan (
    const GarbageCollected & rhs ) const [override], [virtual]
```

Compute the "less than" comparison.



## Parameters

<i>rhs</i>	The <a href="#">GarbageCollected</a> value to compare against.
------------	--

## Returns

The result of the the operation.

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

**5.32.3.10 \_\_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 <a href="#">GarbageCollected</a> value to modulo this by.
------------	---

## Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), and [Tang::ComputedExpressionError](#).

**5.32.3.11 \_\_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 <a href="#">GarbageCollected</a> value to multiply to this.
------------	---

## Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

### 5.32.3.12 `__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](#).

### 5.32.3.13 `__not()`

`GarbageCollected` `ComputedExpressionString::__not ( ) const [override], [virtual]`

Compute the logical not of this value.

#### Returns

The result of the operation.

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

### 5.32.3.14 `__string()`

`GarbageCollected` `ComputedExpressionString::__string ( ) const [override], [virtual]`

Perform a type cast to string.

#### Returns

The result of the the operation.

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

### 5.32.3.15 `__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 <a href="#">GarbageCollected</a> value to subtract from this.
------------	---

## Returns

The result of the operation.

Reimplemented in [Tang::ComputedExpressionInteger](#), [Tang::ComputedExpressionFloat](#), and [Tang::ComputedExpressionError](#).

**5.32.3.16 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](#).

**5.32.3.17 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

<i>val</i>	The value to compare against.
------------	-------------------------------

## Returns

True if equal, false if not.

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

**5.32.3.18 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](#).

**5.32.3.19 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.

**5.32.3.20 is\_equal() [4/6]**

```
bool ComputedExpressionString::is_equal (  
    const string & 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](#).

### 5.32.3.21 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](#).

### 5.32.3.22 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](#).

### 5.32.3.23 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](#).

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

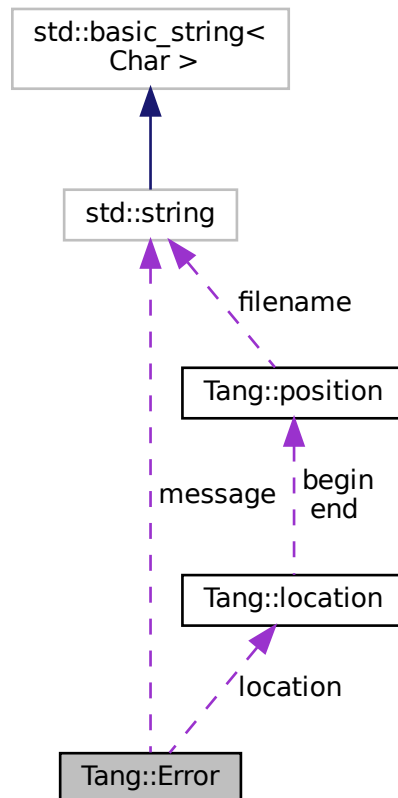
- include/computedExpressionString.hpp
- src/computedExpressionString.cpp

## 5.33 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.*

### 5.33.1 Detailed Description

The `Error` class is used to report any error of the system, whether a syntax (parsing) error or a runtime (execution) error.

### 5.33.2 Constructor & Destructor Documentation

#### 5.33.2.1 Error() [1/2]

```
Tang::Error::Error (
    std::string message ) [inline]
```

Creates an error message using the supplied error string and location.

##### Parameters

<i>message</i>	The error message as a string.
----------------	--------------------------------

#### 5.33.2.2 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

<i>message</i>	The error message as a string.
<i>location</i>	The location of the error.

### 5.33.3 Friends And Related Function Documentation

### 5.33.3.1 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 <a href="#">Error</a> object.

#### Returns

The output stream.

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

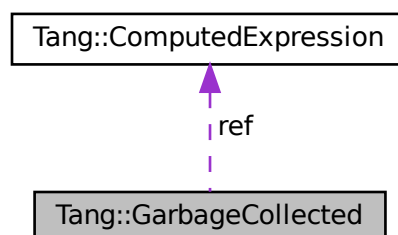
- [include/error.hpp](#)
- [src/error.cpp](#)

## 5.34 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.*
- [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  
*Perform a <= between two [GarbageCollected](#) values.*
- [GarbageCollected](#) operator> (const [GarbageCollected](#) &rhs) const

- Perform a > between two [GarbageCollected](#) values.*
  - [GarbageCollected operator>=](#) (const [GarbageCollected](#) &rhs) const  
*Perform a >= between two [GarbageCollected](#) values.*
  - [GarbageCollected operator==](#) (const [GarbageCollected](#) &rhs) const  
*Perform a == between two [GarbageCollected](#) values.*
  - [GarbageCollected 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

- [GarbageCollected](#) ()  
*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.*

### 5.34.1 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.

### 5.34.2 Constructor & Destructor Documentation

#### 5.34.2.1 [GarbageCollected\(\)](#) [1/3]

```
Tang::GarbageCollected::GarbageCollected (
    const GarbageCollected & other ) [inline]
```

Copy Constructor.

## Parameters

<i>The</i>	other <a href="#">GarbageCollected</a> object to copy.
------------	--

**5.34.2.2 GarbageCollected()** [2/3]

```
Tang::GarbageCollected::GarbageCollected (
    GarbageCollected && other ) [inline]
```

Move Constructor.

## Parameters

<i>The</i>	other <a href="#">GarbageCollected</a> object to move.
------------	--

**5.34.2.3 ~GarbageCollected()**

```
Tang::GarbageCollected::~~GarbageCollected ( ) [inline]
```

Destructor.

Clean up the tracked object, if appropriate.

**5.34.2.4 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.
-----------------	---

**5.34.3 Member Function Documentation****5.34.3.1 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:



#### 5.34.3.2 makeCopy()

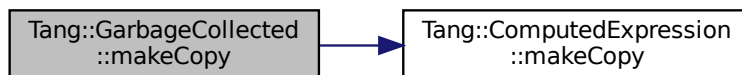
```
GarbageCollected GarbageCollected::makeCopy ( ) const
```

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:



### 5.34.3.3 operator"!()

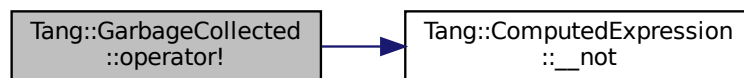
```
GarbageCollected GarbageCollected::operator! ( ) const
```

Perform a logical not on the [GarbageCollected](#) value.

#### Returns

The result of the operation.

Here is the call graph for this function:



### 5.34.3.4 operator"!=(())

```
GarbageCollected GarbageCollected::operator!= (
    const GarbageCollected & rhs ) const
```

Perform a != between two [GarbageCollected](#) values.

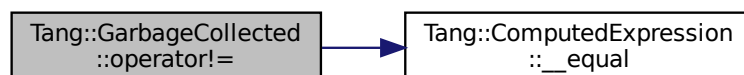
#### Parameters

<i>rhs</i>	The right hand side operand.
------------	------------------------------

#### Returns

The result of the operation.

Here is the call graph for this function:



### 5.34.3.5 operator%()

```
GarbageCollected GarbageCollected::operator% (
    const GarbageCollected & rhs ) const
```

Perform a modulo between two [GarbageCollected](#) values.

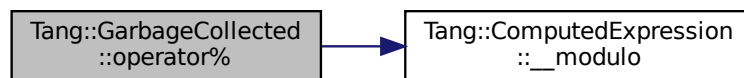
#### Parameters

<i>rhs</i>	The right hand side operand.
------------	------------------------------

#### Returns

The result of the operation.

Here is the call graph for this function:



### 5.34.3.6 operator\*() [1/2]

```
ComputedExpression & GarbageCollected::operator* ( ) const
```

Access the tracked object.

#### Returns

A reference to the tracked object.

### 5.34.3.7 operator\*() [2/2]

```
GarbageCollected GarbageCollected::operator* (
    const GarbageCollected & rhs ) const
```

Perform a multiplication between two [GarbageCollected](#) values.

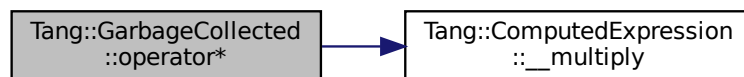
## Parameters

<i>rhs</i>	The right hand side operand.
------------	------------------------------

## Returns

The result of the operation.

Here is the call graph for this function:



### 5.34.3.8 operator+()

```
GarbageCollected GarbageCollected::operator+ (  
    const GarbageCollected & rhs ) const
```

Perform an addition between two `GarbageCollected` values.

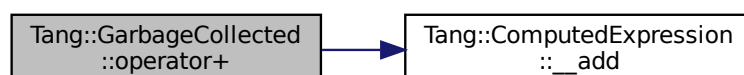
## Parameters

<i>rhs</i>	The right hand side operand.
------------	------------------------------

## Returns

The result of the operation.

Here is the call graph for this function:



#### 5.34.3.9 operator-() [1/2]

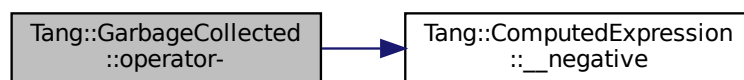
```
GarbageCollected GarbageCollected::operator- ( ) const
```

Perform a negation on the [GarbageCollected](#) value.

##### Returns

The result of the operation.

Here is the call graph for this function:



#### 5.34.3.10 operator-() [2/2]

```
GarbageCollected GarbageCollected::operator- (  
    const GarbageCollected & rhs ) const
```

Perform a subtraction between two [GarbageCollected](#) values.

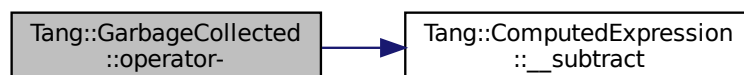
##### Parameters

<i>rhs</i>	The right hand side operand.
------------	------------------------------

##### Returns

The result of the operation.

Here is the call graph for this function:





**5.34.3.11 operator->()**

```
ComputedExpression * GarbageCollected::operator-> ( ) const
```

Access the tracked object as a pointer.

**Returns**

A pointer to the tracked object.

**5.34.3.12 operator/()**

```
GarbageCollected GarbageCollected::operator/ (
    const GarbageCollected & rhs ) const
```

Perform a division between two [GarbageCollected](#) values.

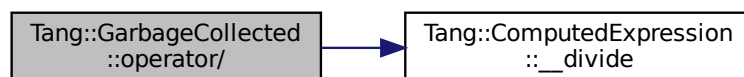
**Parameters**

<i>rhs</i>	The right hand side operand.
------------	------------------------------

**Returns**

The result of the operation.

Here is the call graph for this function:

**5.34.3.13 operator<()**

```
GarbageCollected GarbageCollected::operator< (
    const GarbageCollected & rhs ) const
```

Perform a < between two [GarbageCollected](#) values.

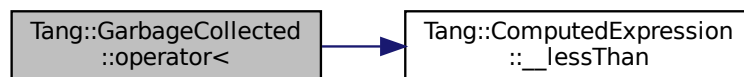
## Parameters

<i>rhs</i>	The right hand side operand.
------------	------------------------------

## Returns

The result of the operation.

Here is the call graph for this function:



## 5.34.3.14 operator&lt;=()

```

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.

## 5.34.3.15 operator=() [1/2]

```

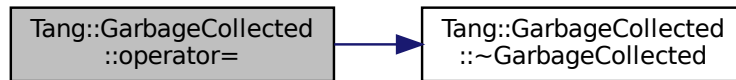
GarbageCollected& Tang::GarbageCollected::operator= (
    const GarbageCollected & other ) [inline]
  
```

Copy Assignment.

## Parameters

<i>The</i>	other <a href="#">GarbageCollected</a> object.
------------	--

Here is the call graph for this function:



#### 5.34.3.16 `operator=()` [2/2]

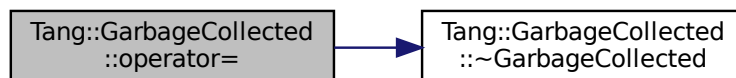
```
GarbageCollected& Tang::GarbageCollected::operator= (
    GarbageCollected && other ) [inline]
```

Move Assignment.

##### Parameters

<i>The</i>	other <a href="#">GarbageCollected</a> object.
------------	--

Here is the call graph for this function:



#### 5.34.3.17 `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.

**5.34.3.18 operator==( ) [2/8]**

```
bool GarbageCollected::operator== (
    const char *const & 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.

**5.34.3.19 operator==( ) [3/8]**

```
bool GarbageCollected::operator== (
    const Error & 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.

**5.34.3.20 operator==( ) [4/8]**

```
GarbageCollected GarbageCollected::operator== (
    const GarbageCollected & rhs ) const
```

Perform a == between two [GarbageCollected](#) values.

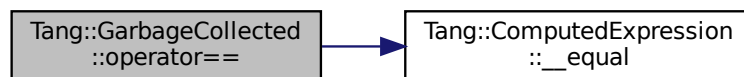
## Parameters

<i>rhs</i>	The right hand side operand.
------------	------------------------------

## Returns

The result of the operation.

Here is the call graph for this function:

**5.34.3.21 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.

**5.34.3.22 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.

**5.34.3.23 operator==( ) [7/8]**

```
bool GarbageCollected::operator== (
    const Tang::float_t & 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.

**5.34.3.24 operator==( ) [8/8]**

```
bool GarbageCollected::operator== (
    const Tang::integer_t & val ) const
```

Compare the [GarbageCollected](#) tracked object with a supplied value.

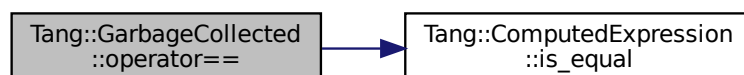
**Parameters**

<i>val</i>	The value to compare the tracked object against.
------------	--

**Returns**

True if they are equal, false otherwise.

Here is the call graph for this function:



### 5.34.3.25 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.

### 5.34.3.26 operator>=()

```
GarbageCollected GarbageCollected::operator>= (
    const GarbageCollected & rhs ) const
```

Perform a >= between two [GarbageCollected](#) values.

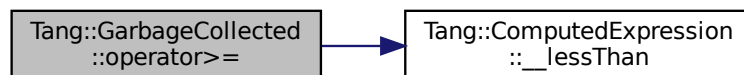
#### Parameters

<i>rhs</i>	The right hand side operand.
------------	------------------------------

#### Returns

The result of the operation.

Here is the call graph for this function:



## 5.34.4 Friends And Related Function Documentation

#### 5.34.4.1 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 <a href="#">GarbageCollected</a> value.

##### Returns

The output stream.

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

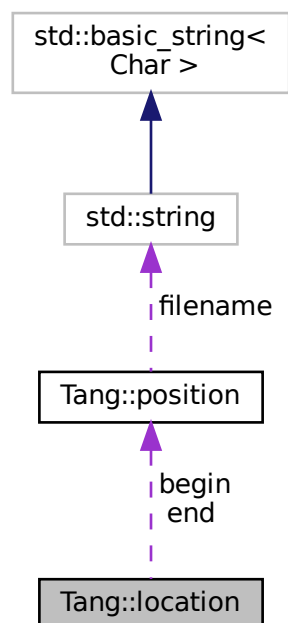
- [include/garbageCollected.hpp](#)
- [src/garbageCollected.cpp](#)

## 5.35 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.*

### 5.35.1 Detailed Description

Two points in a source file.

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

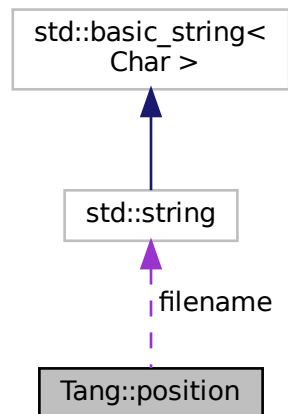
- build/generated/[location.hh](#)

## 5.36 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.*

### 5.36.1 Detailed Description

A point in a source file.

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

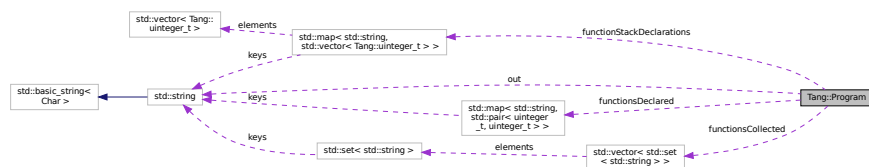
- [build/generated/location.hh](#)

## 5.37 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](#) (std::string code, [CodeType](#) codeType)  
*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.*
- [Program](#) & [execute](#) ()  
*Execute the program's Bytecode, and return the current [Program](#) object.*
- 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 [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)  
*Add a string to the environment.*
- const std::map< std::string, 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.*

## Public Attributes

- `std::string out`  
*The output of the program, resulting from the program execution.*
- `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.*

### 5.37.1 Detailed Description

Represents a compiled script or template that may be executed.

### 5.37.2 Member Enumeration Documentation

#### 5.37.2.1 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.

### 5.37.3 Constructor & Destructor Documentation

#### 5.37.3.1 Program()

```
Program::Program (
    std::string code,
    Program::CodeType codeType )
```

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 <code>Script</code> or <code>Template</code> .

## 5.37.4 Member Function Documentation

### 5.37.4.1 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.
-----------------	---

### 5.37.4.2 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.

### 5.37.4.3 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.
-----------------	--

#### 5.37.4.4 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.

#### 5.37.4.5 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.
-------------	----------------------

#### 5.37.4.6 addString()

```
void Program::addString (
    const std::string & name )
```

Add a string 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.

#### 5.37.4.7 dumpBytecode()

```
string Program::dumpBytecode ( ) const
```

Get the Opcodes of the compiled program, formatted like Assembly.

**Returns**

A string containing the Opcode representation.

**5.37.4.8 execute()**

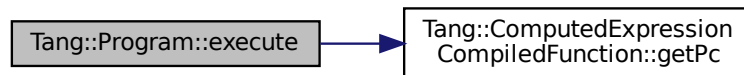
```
Program & Program::execute ( )
```

Execute the program's Bytecode, and return the current [Program](#) object.

**Returns**

The current [Program](#) object.

Here is the call graph for this function:

**5.37.4.9 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.

**5.37.4.10 getBytecode()**

```
const Bytecode & Program::getBytecode ( )
```

Get the Bytecode vector.

**Returns**

The Bytecode vector.



#### 5.37.4.11 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.

#### 5.37.4.12 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.

#### 5.37.4.13 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.

#### 5.37.4.14 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.

#### 5.37.4.15 getStrings()

```
const map< string, 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.

#### 5.37.4.16 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 <code>continue</code> should jump to.
---------------	---

Here is the call graph for this function:



#### 5.37.4.17 popContinueStack()

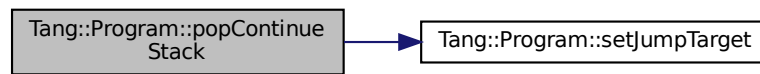
```
void Program::popContinueStack (
    size_t target )
```

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 <code>continue</code> should jump to.
---------------	---

Here is the call graph for this function:



#### 5.37.4.18 pushEnvironment()

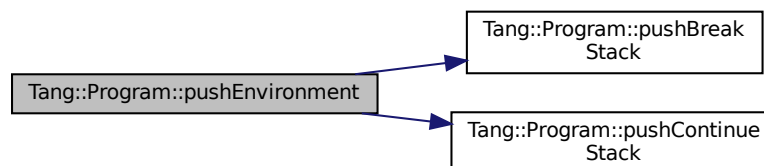
```
void Program::pushEnvironment (
    const std::shared_ptr< AstNode > & ast )
```

Create a new compile/execute environment stack entry.

##### Parameters

<i>ast</i>	The ast node from which this new environment will be formed.
------------	--

Here is the call graph for this function:



#### 5.37.4.19 setFunctionStackDeclaration()

```
bool Program::setFunctionStackDeclaration (
    size_t opcodeAddress,
    unsigned_t argc,
    unsigned_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.

**5.37.4.20 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.

**5.37.5 Member Data Documentation****5.37.5.1 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-dumpBytecode.cpp](#)
- [src/program-execute.cpp](#)
- [src/program.cpp](#)

**5.38 Tang::SingletonObjectPool< T > Class Template Reference**

A thread-safe, singleton object pool of the designated type.

```
#include <singletonObjectPool.hpp>
```

## 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.*

### 5.38.1 Detailed Description

```
template<class T>
class Tang::SingletonObjectPool< T >
```

A thread-safe, singleton object pool of the designated type.

### 5.38.2 Member Function Documentation

#### 5.38.2.1 [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.

#### 5.38.2.2 [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.

#### 5.38.2.3 [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.
------------	---------------------------------

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

- include/[singletonObjectPool.hpp](#)

## 5.39 Tang::TangBase Class Reference

The base class for the Tang programming language.

```
#include <tangBase.hpp>
```

### Public Member Functions

- [TangBase](#) ()  
*The constructor.*
- [Program compileScript](#) (std::string script)  
*Compile the provided source code as a script and return a [Program](#).*

#### 5.39.1 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).

#### 5.39.2 Constructor & Destructor Documentation

##### 5.39.2.1 TangBase()

```
TangBase::TangBase ( )
```

The constructor.

Isn't it glorious.

#### 5.39.3 Member Function Documentation

##### 5.39.3.1 compileScript()

```
Program TangBase::compileScript (
    std::string script )
```

Compile the provided source code 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.

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

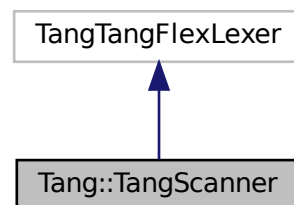
- [include/tangBase.hpp](#)
- [src/tangBase.cpp](#)

## 5.40 Tang::TangScanner Class Reference

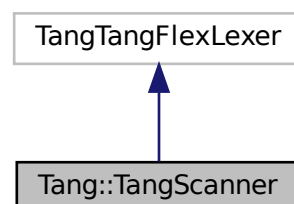
The Flex lexer class for the main Tang language.

```
#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.*

### 5.40.1 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.

### 5.40.2 Constructor & Destructor Documentation

#### 5.40.2.1 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. It's 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)

### 5.40.3 Member Function Documentation

#### 5.40.3.1 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](#)



## Chapter 6

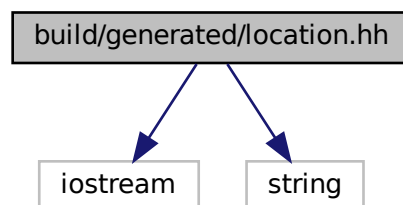
# File Documentation

### 6.1 build/generated/location.hh File Reference

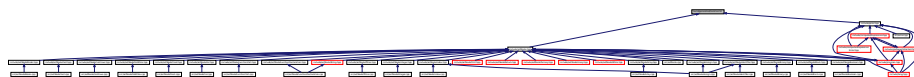
Define the Tang ::location class.

```
#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&lt;&lt;() [2/2]

```
template<typename YYChar >
std::basic_ostream<YYChar>& Tang::operator<< (
    std::basic_ostream< YYChar > & ostr,
    const position & pos )
```

Intercept output stream redirection.

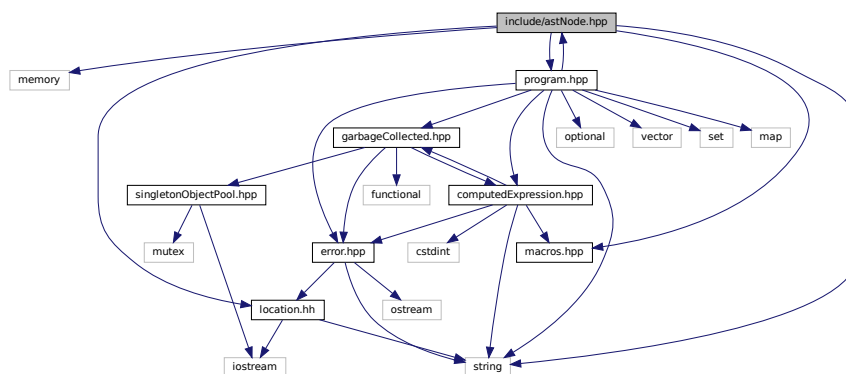
## Parameters

<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 "program.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).

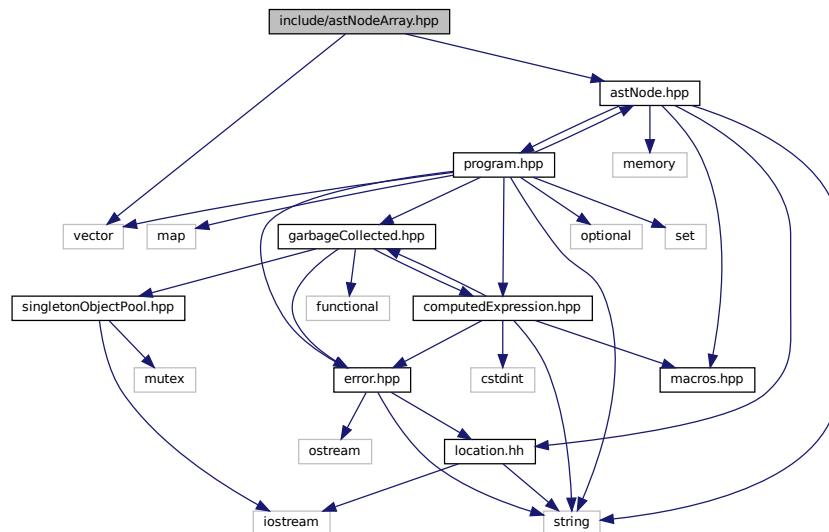
### 6.2.1 Detailed Description

Declare the [Tang::AstNode](#) base class.

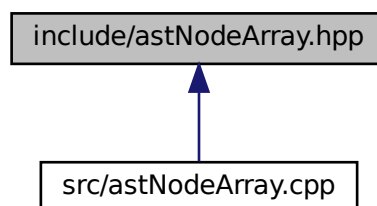
## 6.3 include/astNodeArray.hpp File Reference

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

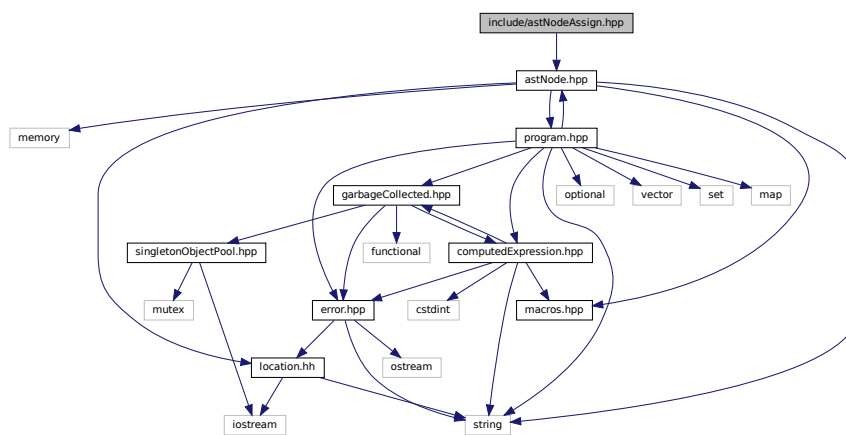
Declare the [Tang::AstNodeArray](#) class.

## 6.4 include/astNodeAssign.hpp File Reference

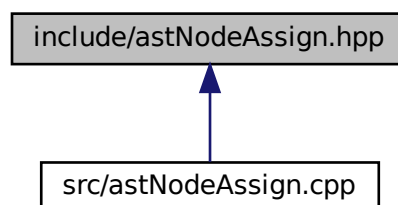
Declare the [Tang::AstNodeAssign](#) class.

```
#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.

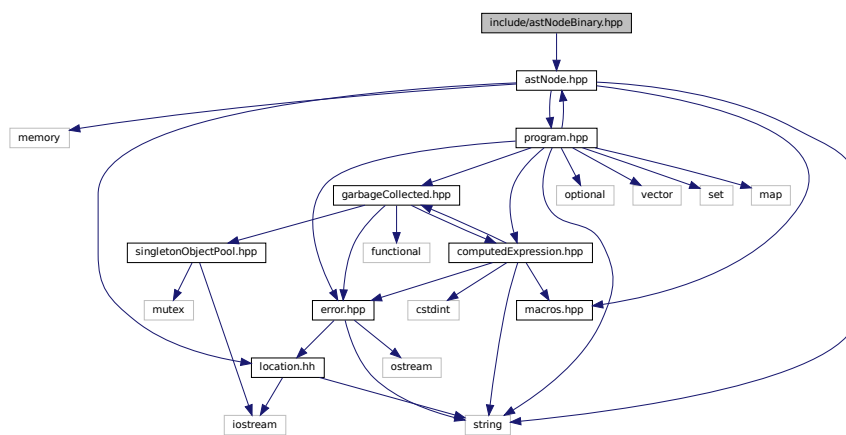
### 6.4.1 Detailed Description

Declare the [Tang::AstNodeAssign](#) class.

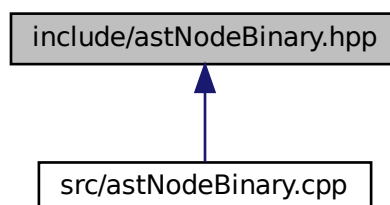
## 6.5 include/astNodeBinary.hpp File Reference

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

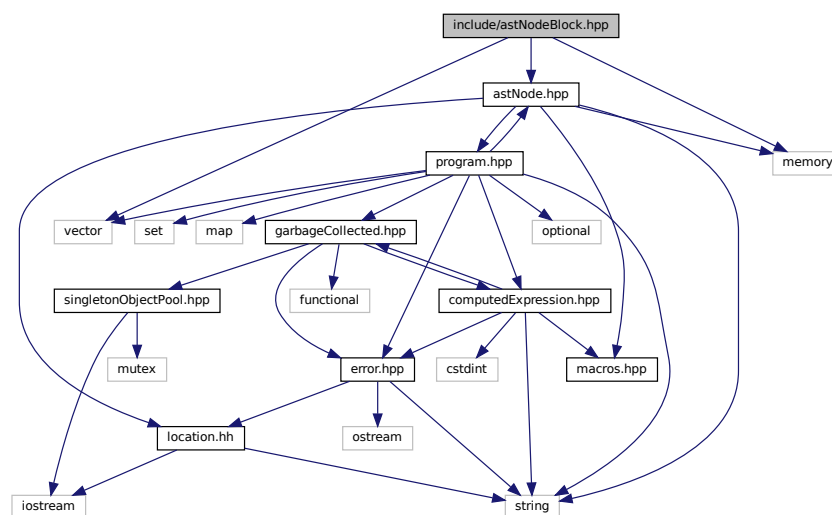
Declare the [Tang::AstNodeBinary](#) class.

## 6.6 include/astNodeBlock.hpp File Reference

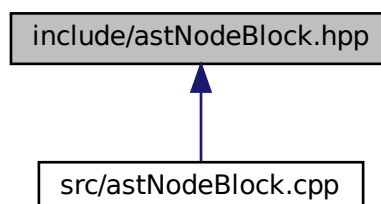
Declare the [Tang::AstNodeBlock](#) class.

```
#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

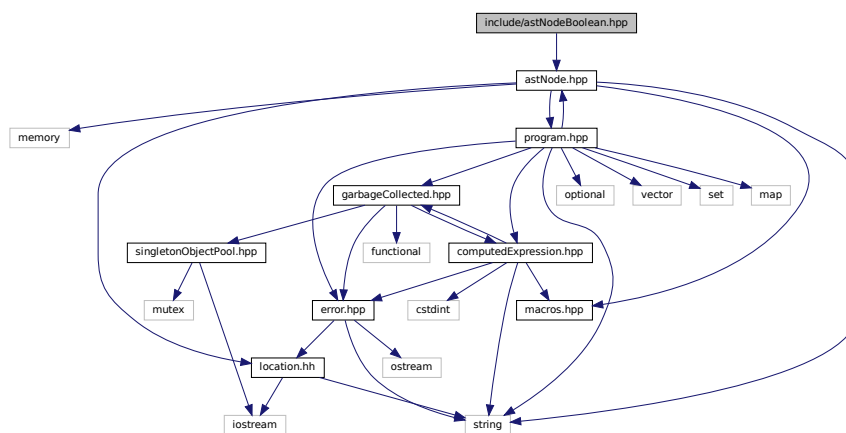
Declare the [Tang::AstNodeBlock](#) class.

## 6.7 include/astNodeBoolean.hpp File Reference

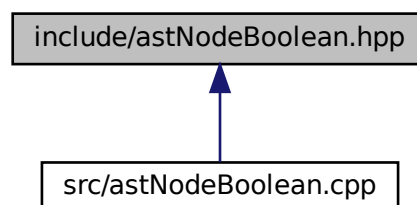
Declare the [Tang::AstNodeBoolean](#) class.

```
#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.

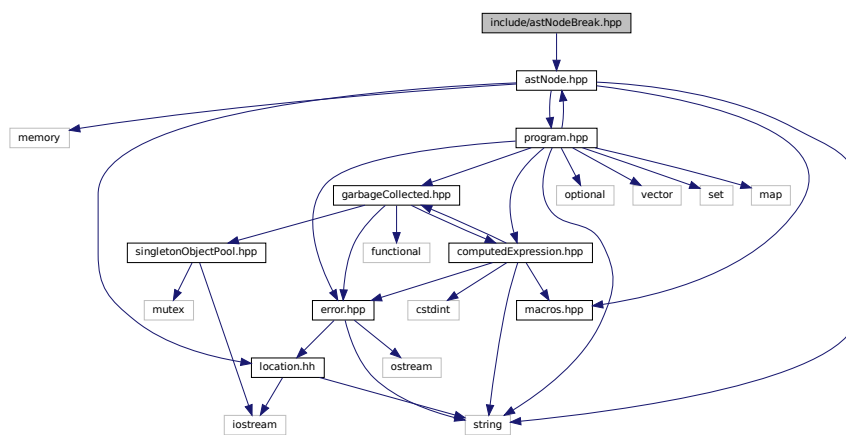
### 6.7.1 Detailed Description

Declare the [Tang::AstNodeBoolean](#) class.

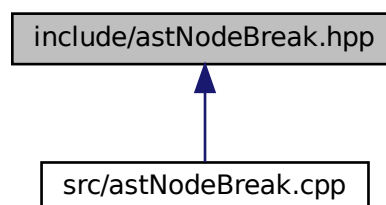
## 6.8 include/astNodeBreak.hpp File Reference

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.

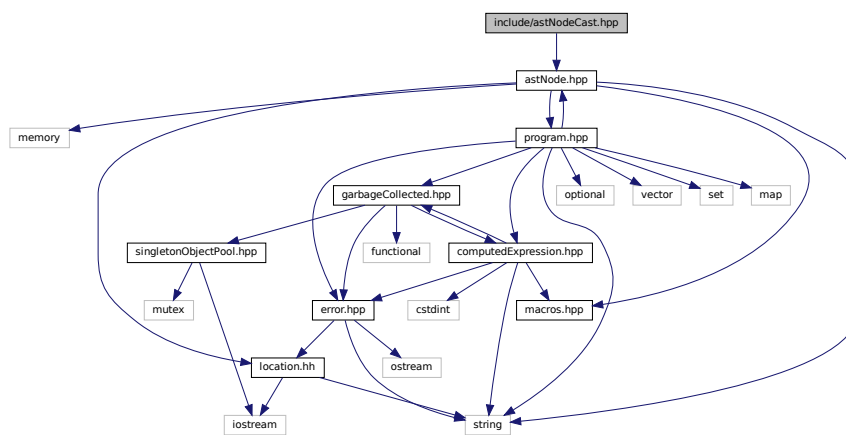
### 6.8.1 Detailed Description

Declare the [Tang::AstNodeBreak](#) class.

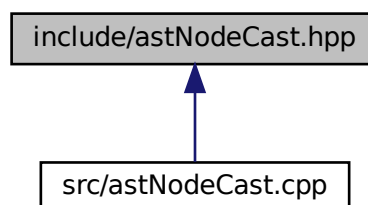
## 6.9 include/astNodeCast.hpp File Reference

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.

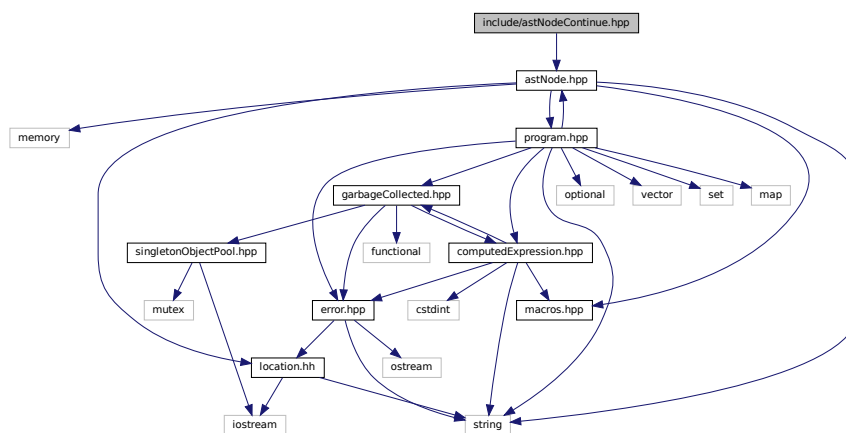
### 6.9.1 Detailed Description

Declare the [Tang::AstNodeCast](#) class.

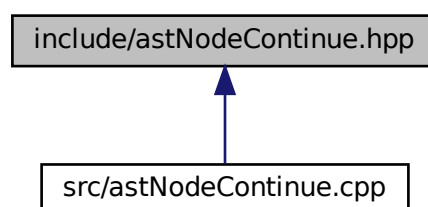
## 6.10 include/astNodeContinue.hpp File Reference

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

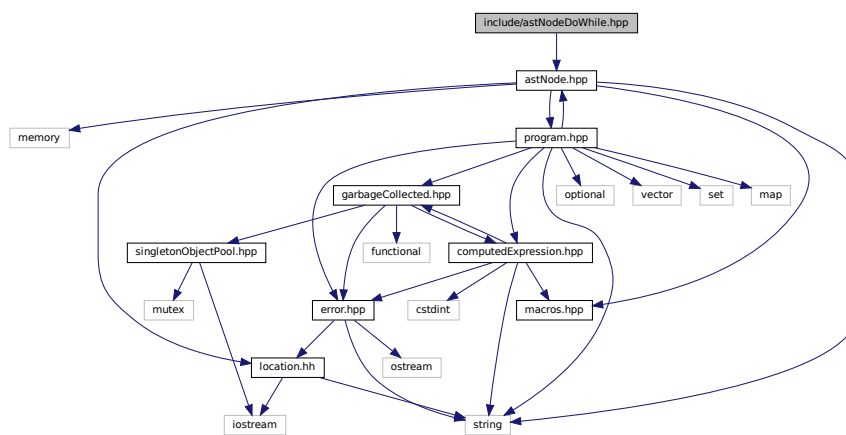
Declare the [Tang::AstNodeContinue](#) class.

## 6.11 include/astNodeDoWhile.hpp File Reference

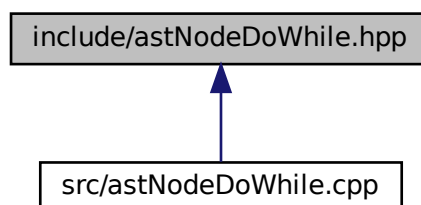
Declare the [Tang::AstNodeDoWhile](#) class.

```
#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.

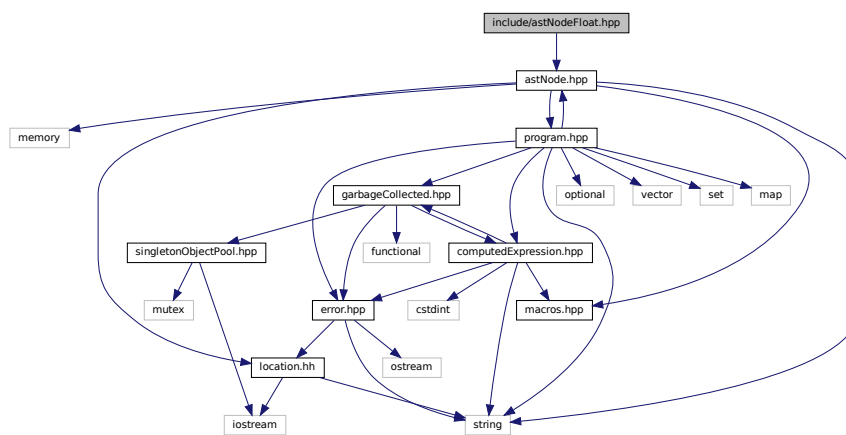
### 6.11.1 Detailed Description

Declare the [Tang::AstNodeDoWhile](#) class.

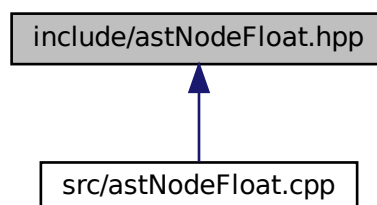
## 6.12 include/astNodeFloat.hpp File Reference

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.

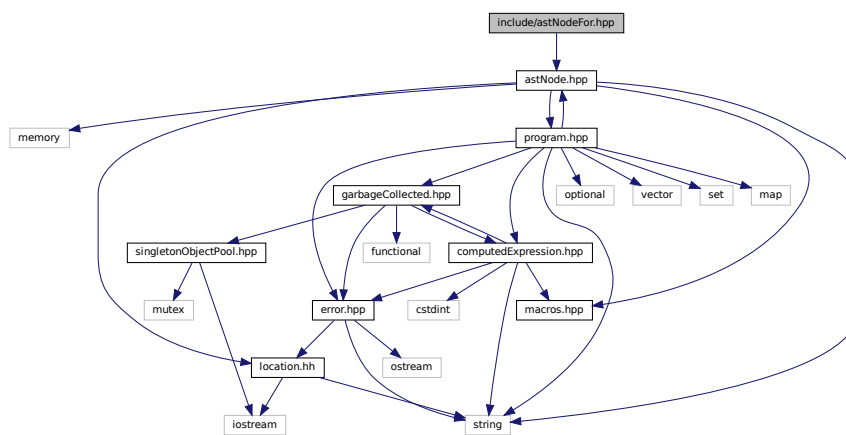
### 6.12.1 Detailed Description

Declare the [Tang::AstNodeFloat](#) class.

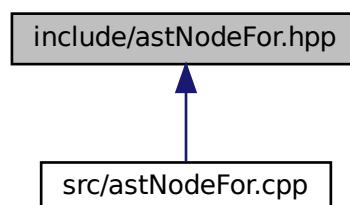
## 6.13 include/astNodeFor.hpp File Reference

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

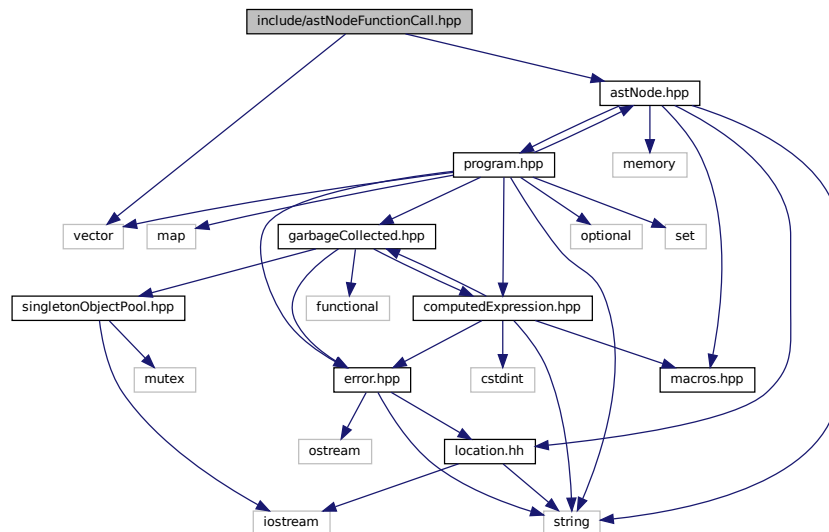
Declare the [Tang::AstNodeFor](#) class.

## 6.14 include/astNodeFunctionCall.hpp File Reference

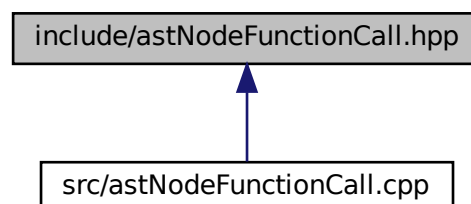
Declare the [Tang::AstNodeFunctionCall](#) class.

```
#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.

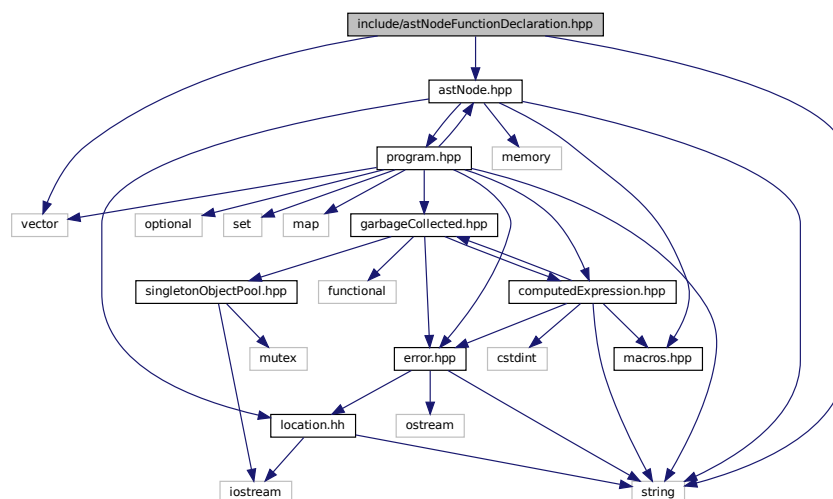
### 6.14.1 Detailed Description

Declare the [Tang::AstNodeFunctionCall](#) class.

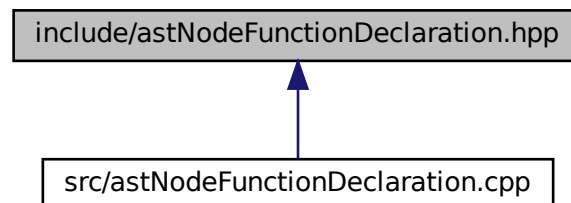
## 6.15 include/astNodeFunctionDeclaration.hpp File Reference

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.

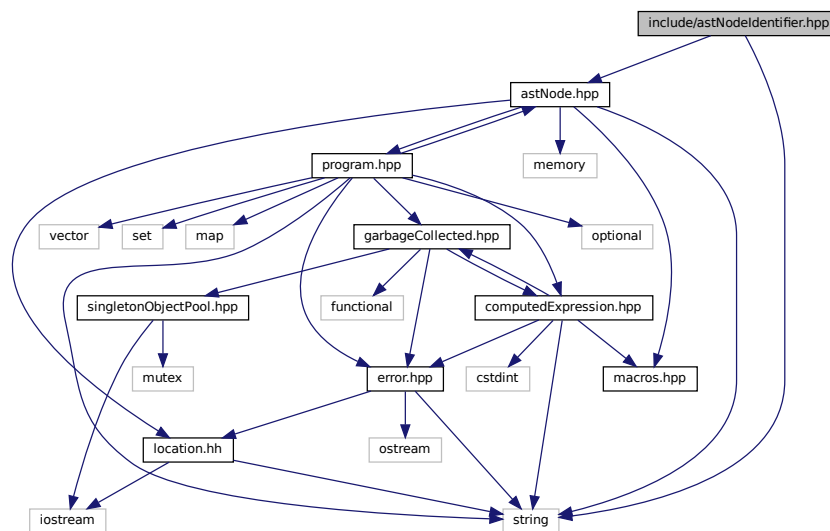
### 6.15.1 Detailed Description

Declare the [Tang::AstNodeFunctionDeclaration](#) class.

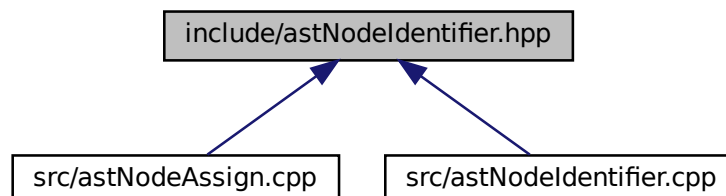
## 6.16 include/astNodeIdentifier.hpp File Reference

Declare the [Tang::AstNodeIdentifier](#) class.

```
#include <string>
#include "astNode.hpp"
Include dependency graph for astNodeIdentifier.hpp:
```



This graph shows which files directly or indirectly include this file:



## Classes

- class [Tang::AstNodeIdentifier](#)  
An *AstNode* that represents an identifier.

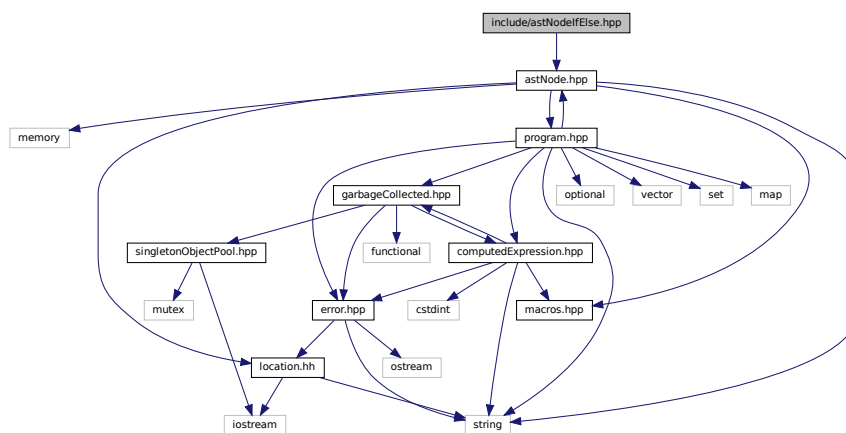
### 6.16.1 Detailed Description

Declare the [Tang::AstNodeIdentifier](#) class.

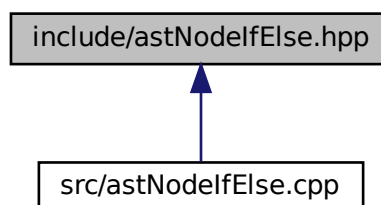
## 6.17 include/astNodeIfElse.hpp File Reference

Declare the [Tang::AstNodeIfElse](#) 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.

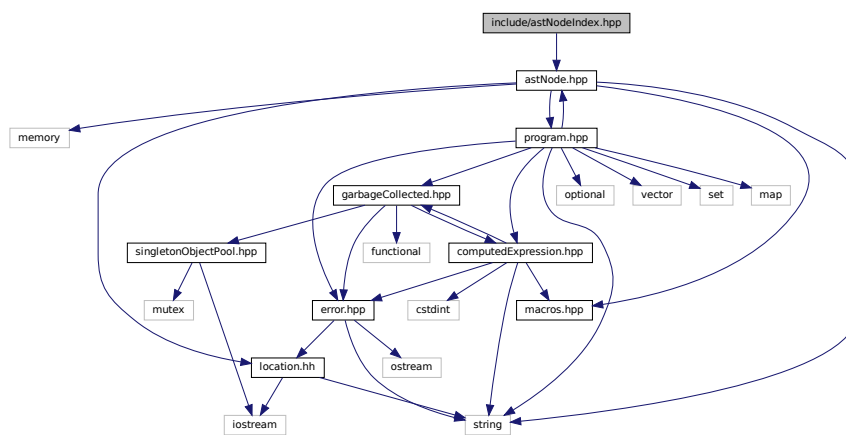
### 6.17.1 Detailed Description

Declare the [Tang::AstNodeIfElse](#) class.

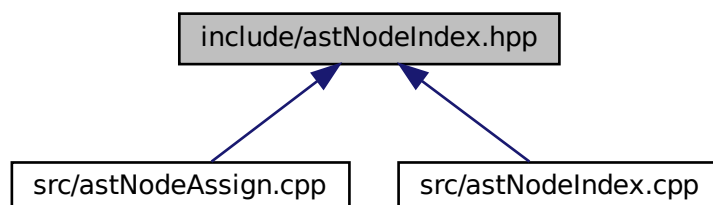
## 6.18 include/astNodeIndex.hpp File Reference

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

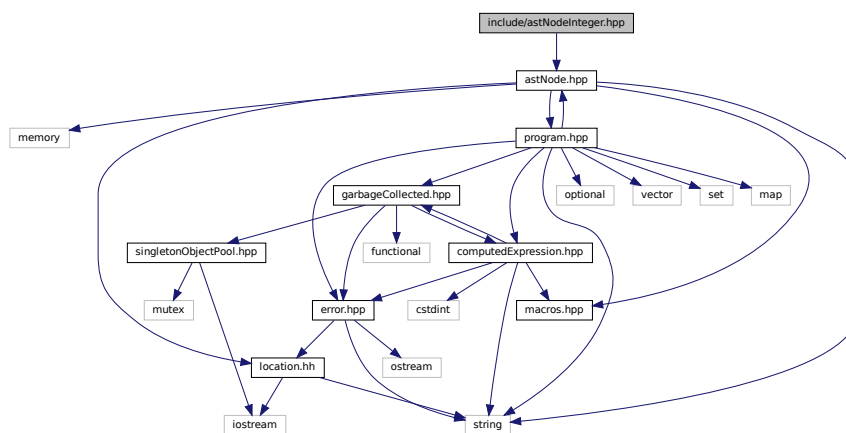
Declare the [Tang::AstNodeIndex](#) class.

## 6.19 include/astNodeInteger.hpp File Reference

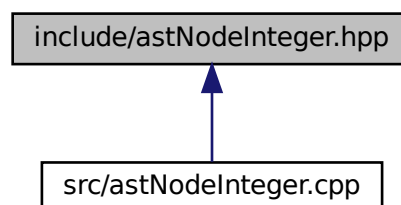
Declare the [Tang::AstNodeInteger](#) class.

```
#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

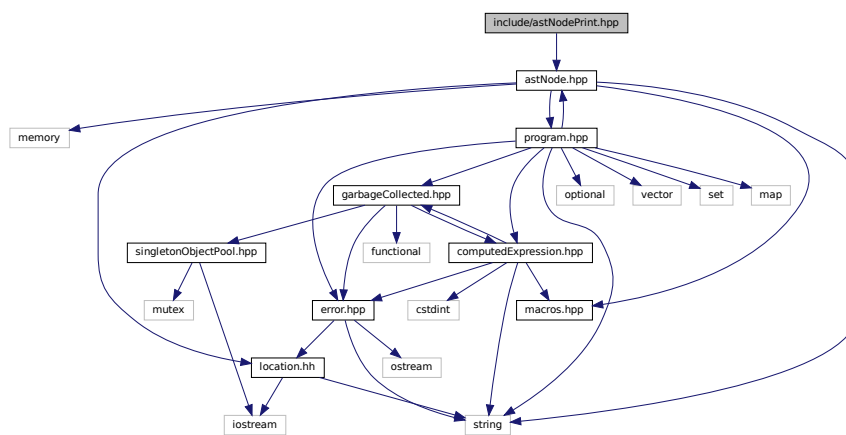
Declare the `Tang::AstNodeInteger` class.

## 6.20 include/astNodePrint.hpp File Reference

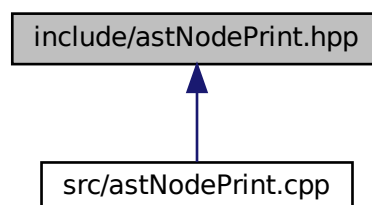
Declare the `Tang::AstNodePrint` class.

```
#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 typeoperation.

### 6.20.1 Detailed Description

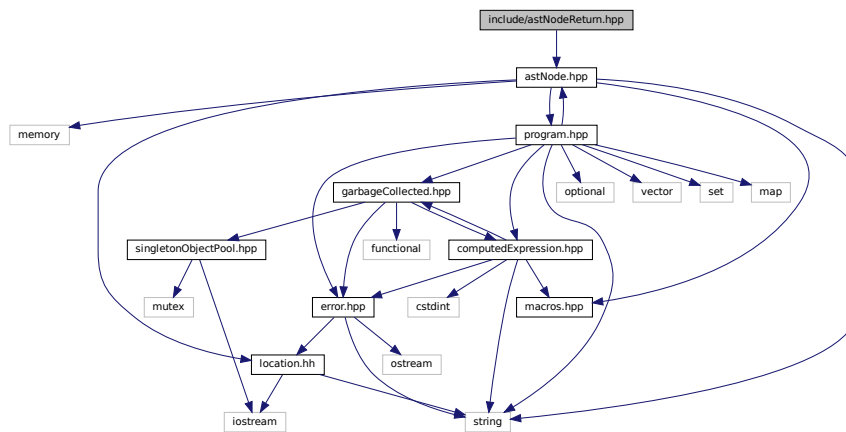
Declare the [Tang::AstNodePrint](#) class.

## 6.21 include/astNodeReturn.hpp File Reference

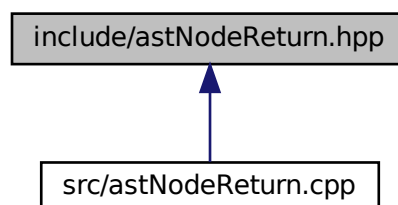
Declare the [Tang::AstNodeReturn](#) class.

```
#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.

### 6.21.1 Detailed Description

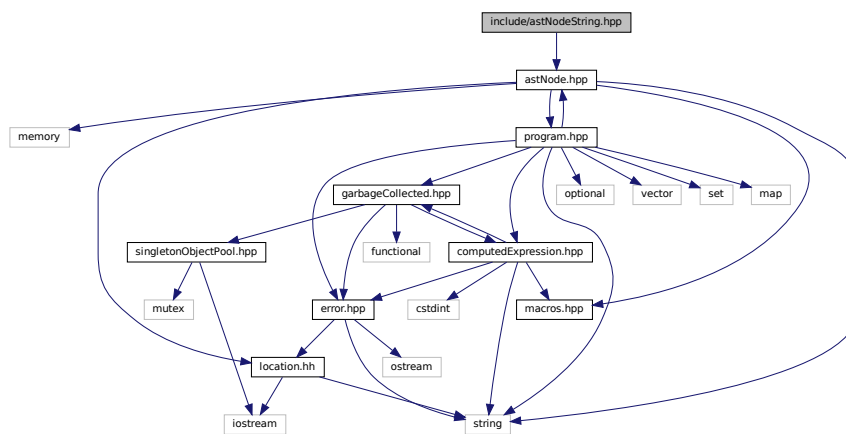
Declare the [Tang::AstNodeReturn](#) class.

## 6.22 include/astNodeString.hpp File Reference

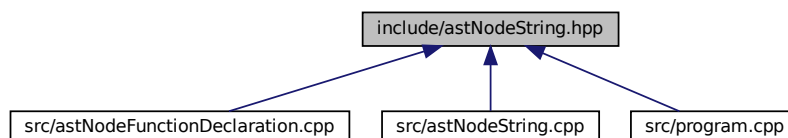
Declare the [Tang::AstNodeString](#) class.

```
#include "astNode.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*.

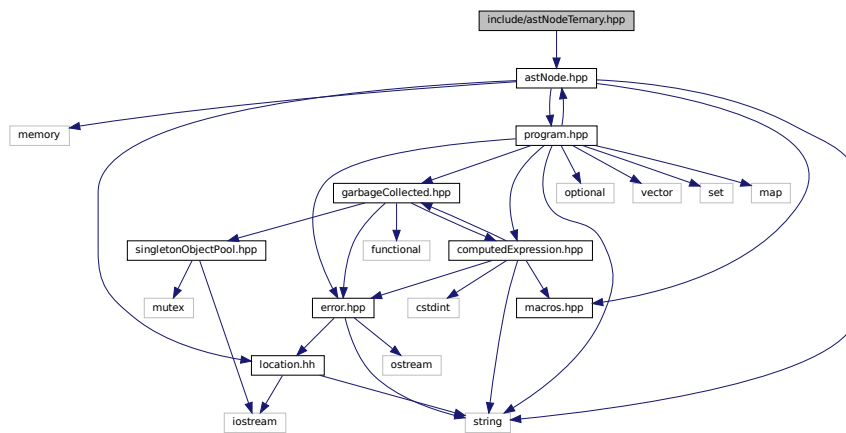
### 6.22.1 Detailed Description

Declare the [Tang::AstNodeString](#) class.

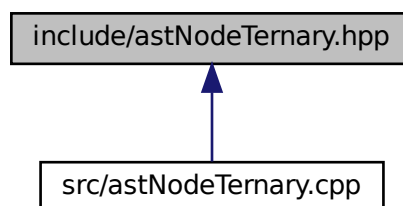
## 6.23 include/astNodeTernary.hpp File Reference

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.

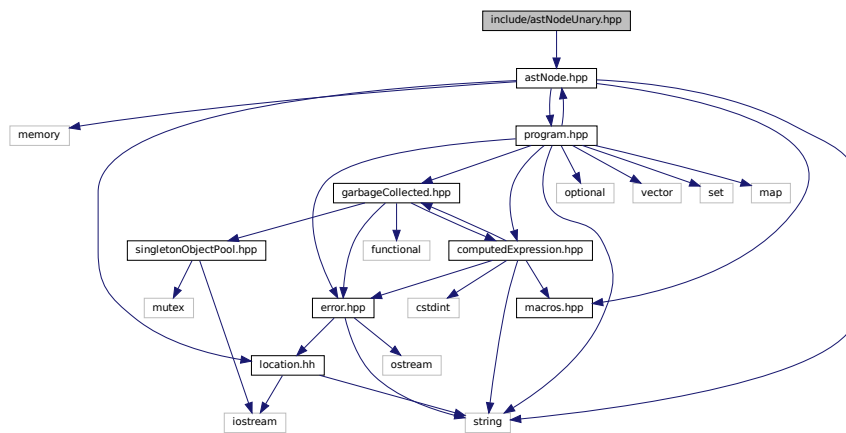
### 6.23.1 Detailed Description

Declare the [Tang::AstNodeUnary](#) class.

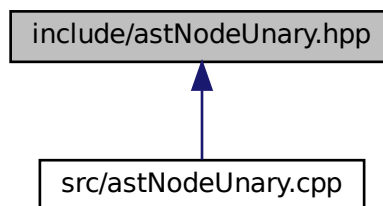
## 6.24 include/astNodeUnary.hpp File Reference

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.

### 6.24.1 Detailed Description

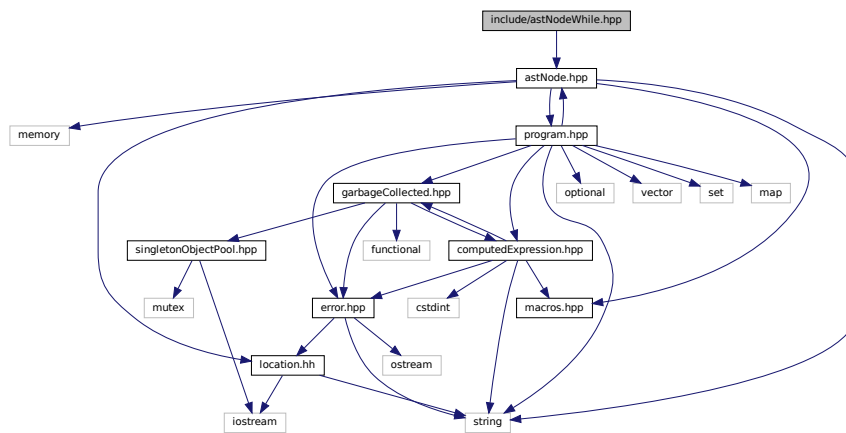
Declare the [Tang::AstNodeUnary](#) class.

## 6.25 include/astNodeWhile.hpp File Reference

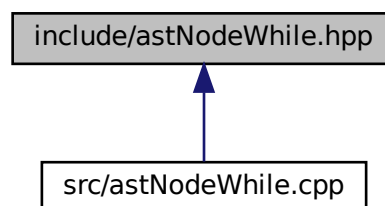
Declare the [Tang::AstNodeWhile](#) class.

```
#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.

### 6.25.1 Detailed Description

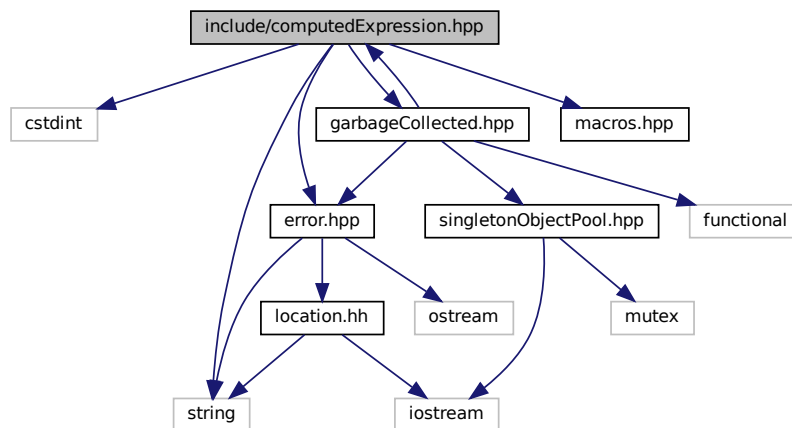
Declare the [Tang::AstNodeWhile](#) class.

## 6.26 include/computedExpression.hpp File Reference

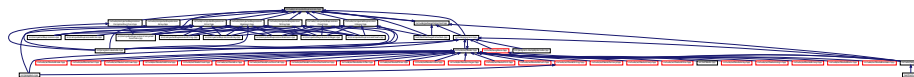
Declare the [Tang::ComputedExpression](#) base class.

```
#include <stdint>
#include <string>
#include "macros.hpp"
#include "garbageCollected.hpp"
#include "error.hpp"
#include "location.hh"
#include "ostream"
#include "mutex"
#include "functional"
#include "singletonObjectPool.hpp"
#include "iostream"
#include "string"
#include "location.hh"
#include "ostream"
#include "mutex"
#include "functional"
#include "singletonObjectPool.hpp"
#include "iostream"
#include "string"
```

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.*

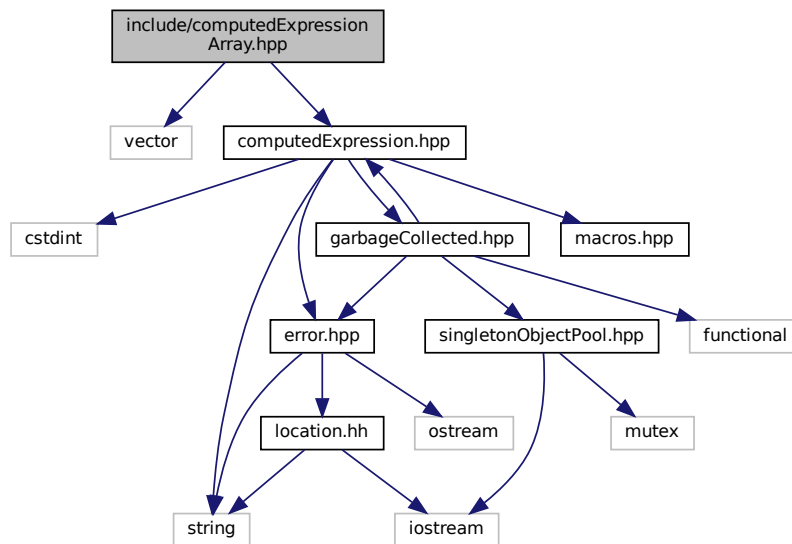
### 6.26.1 Detailed Description

Declare the [Tang::ComputedExpression](#) base class.

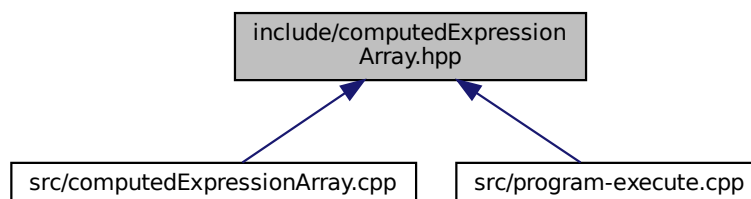
## 6.27 include/computedExpressionArray.hpp File Reference

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.*

#### 6.27.1 Detailed Description

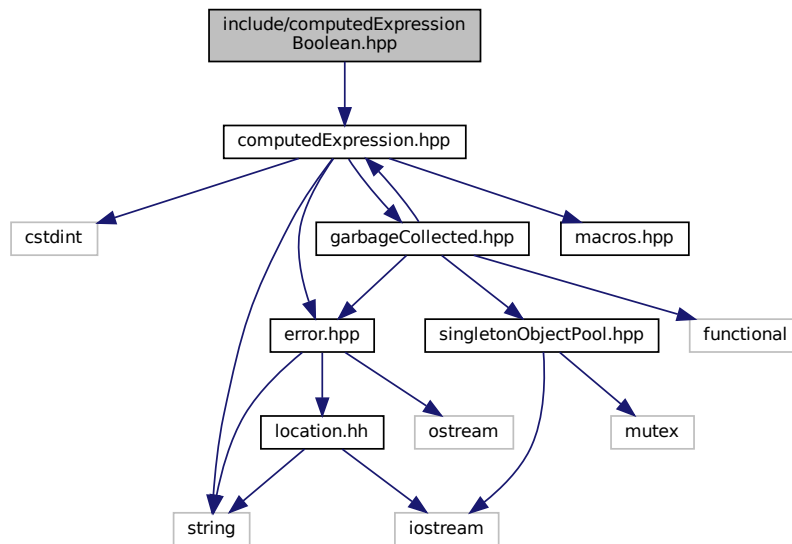
Declare the [Tang::ComputedExpressionArray](#) class.

## 6.28 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.*

### 6.28.1 Detailed Description

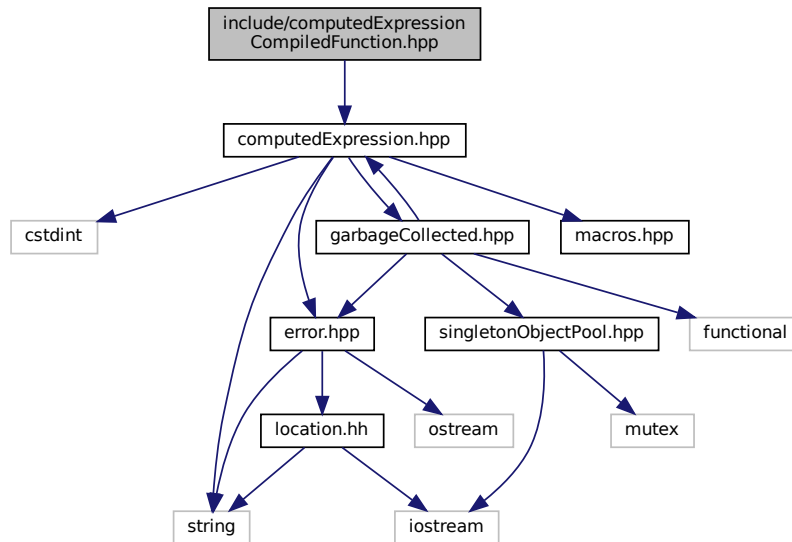
Declare the [Tang::ComputedExpressionBoolean](#) class.

## 6.29 include/computedExpressionCompiledFunction.hpp File Reference

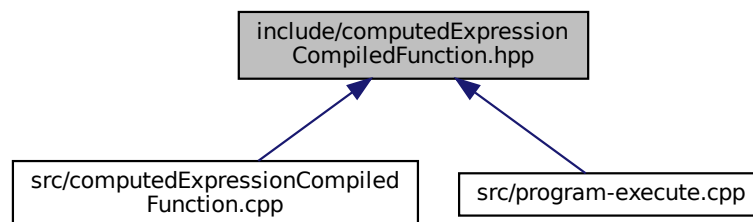
Declare the [Tang::ComputedExpressionCompiledFunction](#) class.

```
#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.*

### 6.29.1 Detailed Description

Declare the [Tang::ComputedExpressionCompiledFunction](#) class.



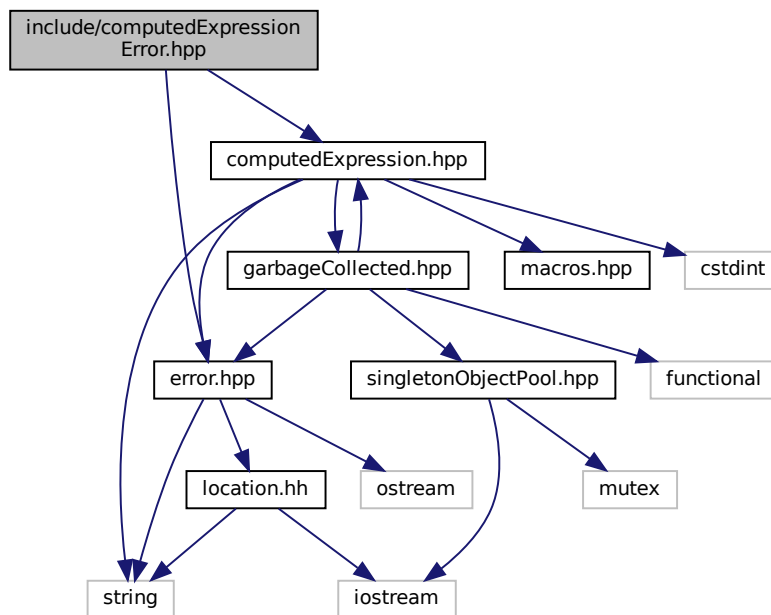
## 6.30 include/computedExpressionError.hpp File Reference

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](#).*

#### 6.30.1 Detailed Description

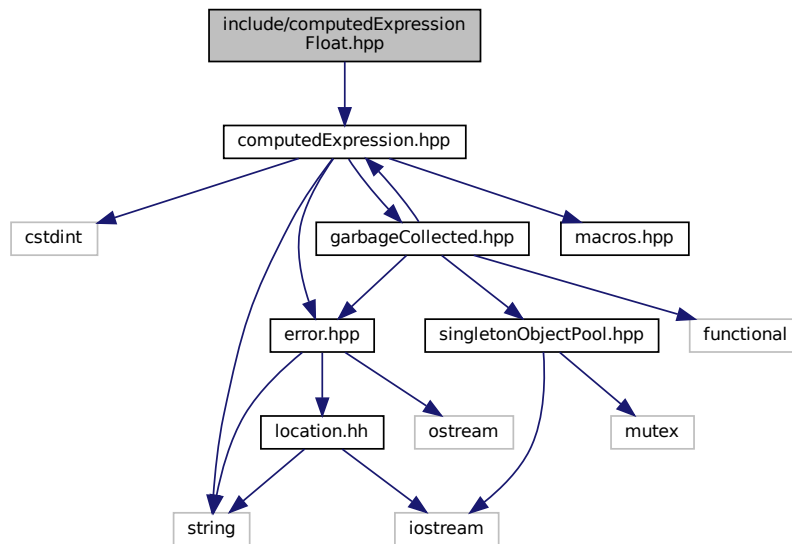
Declare the [Tang::ComputedExpressionError](#) class.

## 6.31 include/computedExpressionFloat.hpp File Reference

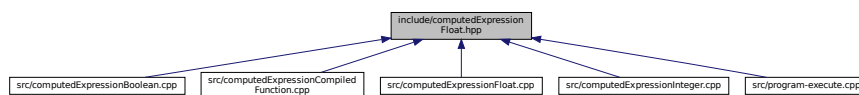
Declare the [Tang::ComputedExpressionFloat](#) class.

```
#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.*

### 6.31.1 Detailed Description

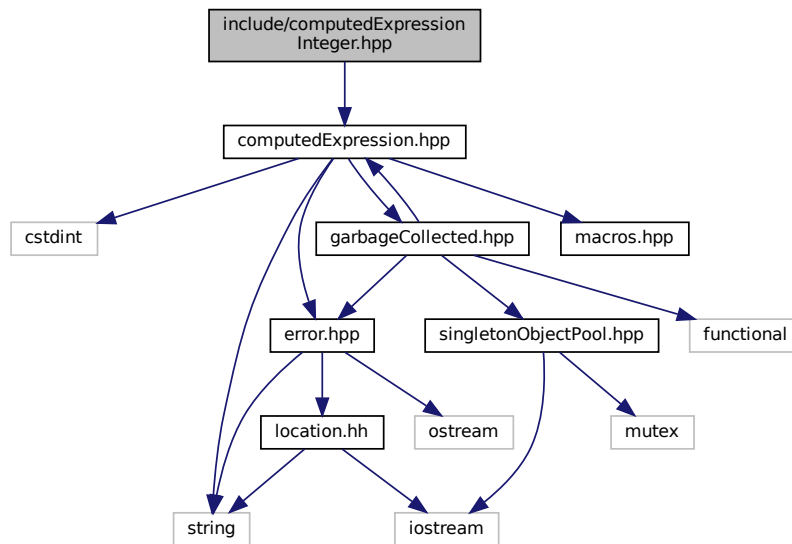
Declare the [Tang::ComputedExpressionFloat](#) class.

## 6.32 include/computedExpressionInteger.hpp File Reference

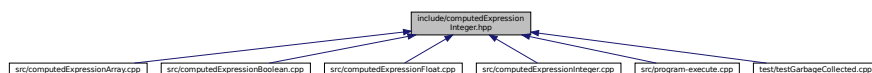
Declare the [Tang::ComputedExpressionInteger](#) class.

```
#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.*

### 6.32.1 Detailed Description

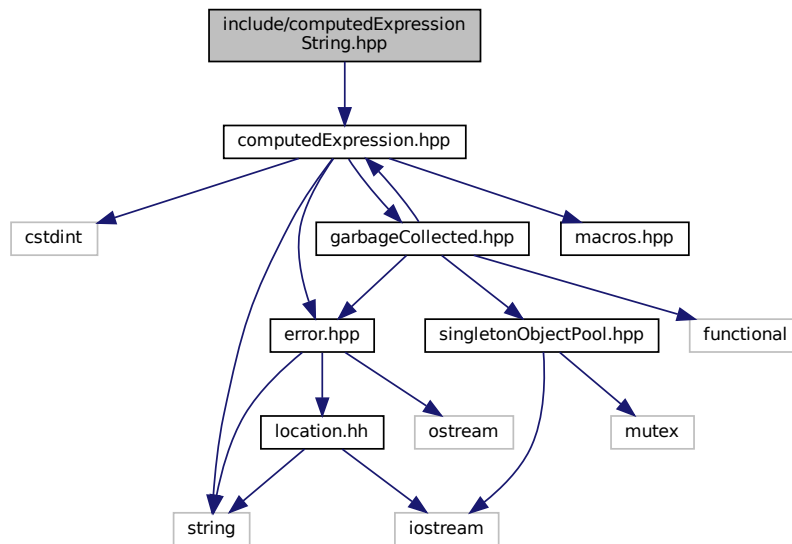
Declare the [Tang::ComputedExpressionInteger](#) class.

## 6.33 include/computedExpressionString.hpp File Reference

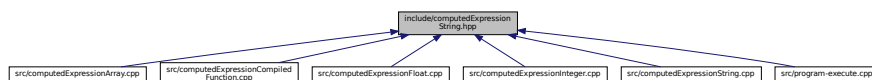
Declare the [Tang::ComputedExpressionString](#) class.

```
#include "computedExpression.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.*

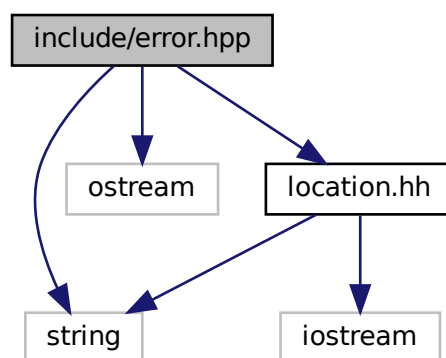
#### 6.33.1 Detailed Description

Declare the [Tang::ComputedExpressionString](#) class.

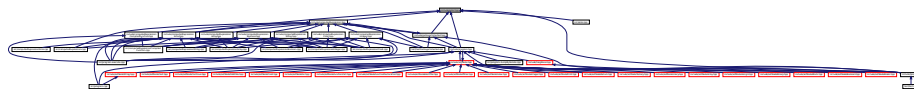
## 6.34 include/error.hpp File Reference

Declare the [Tang::Error](#) class used to describe syntax and runtime errors.

```
#include <string>
#include <ostream>
#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.*

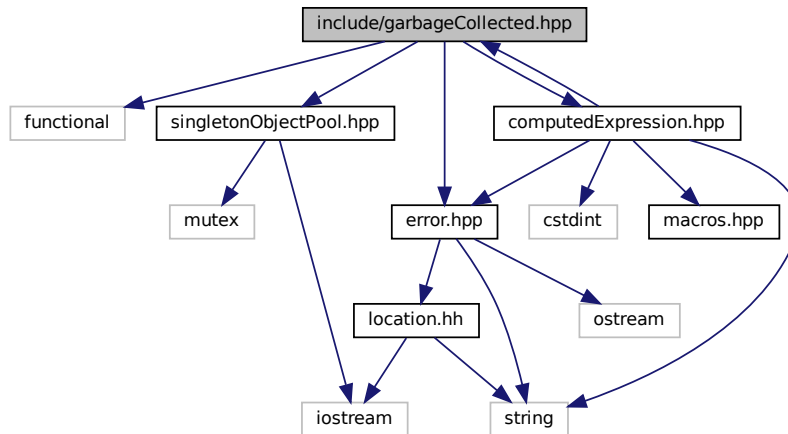
#### 6.34.1 Detailed Description

Declare the [Tang::Error](#) class used to describe syntax and runtime errors.

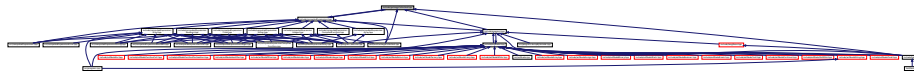
## 6.35 include/garbageCollected.hpp File Reference

Declare the [Tang::GarbageCollected](#) class.

```
#include <functional>
#include "singletonObjectPool.hpp"
#include "computedExpression.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.*

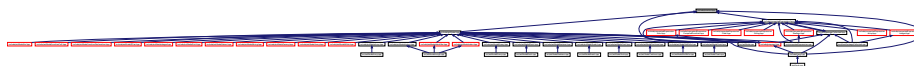
### 6.35.1 Detailed Description

Declare the [Tang::GarbageCollected](#) class.

## 6.36 include/macros.hpp File Reference

Contains generic macros.

This graph shows which files directly or indirectly include this file:



## Typedefs

- using `Tang::integer_t` = `int32_t`  
Define the size of signed integers used by Tang.
- using `Tang::uinteger_t` = `int32_t`  
Define the size of integers used by Tang.
- using `Tang::float_t` = `float`  
Define the size of floats used by Tang.

### 6.36.1 Detailed Description

Contains generic macros.

## 6.37 include/opcode.hpp File Reference

Declare the Opcodes used in the Bytecode representation of a program.

This graph shows which files directly or indirectly include this file:



## Enumerations

- enum class `Tang::Opcode` {  
`POP` , `PEEK` , `POKE` , `COPY` ,  
`JMP` , `JMPF` , `JMPF_POP` , `JMPT` ,  
`JMPT_POP` , `NULLVAL` , `INTEGER` , `FLOAT` ,  
`BOOLEAN` , `STRING` , `ARRAY` , `FUNCTION` ,  
`ASSIGNINDEX` , `ADD` , `SUBTRACT` , `MULTIPLY` ,  
`DIVIDE` , `MODULO` , `NEGATIVE` , `NOT` ,  
`LT` , `LTE` , `GT` , `GTE` ,  
`EQ` , `NEQ` , `INDEX` , `CASTINTEGER` ,  
`CASTFLOAT` , `CASTBOOLEAN` , `CALLFUNC` , `RETURN` ,  
`PRINT` }

### 6.37.1 Detailed Description

Declare the Opcodes used in the Bytecode representation of a program.

### 6.37.2 Enumeration Type Documentation

#### 6.37.2.1 Opcode

```
enum Tang::Opcode [strong]
```

## 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	PC #: read val, if false, set pc to PC #.
JMPF_POP	PC #: pop val, if false, set pc to PC #.
JMPT	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.
FUNCTION	Get argc, PC#: push function(argc, PC #)
ASSIGNINDEX	Pop index, pop collection, pop value, push (collection[index] = value)
ADD	Pop rhs, pop lhs, push lhs + rhs.
SUBTRACT	Pop rhs, pop lhs, push lhs - rhs.
MULTIPLY	Pop rhs, pop lhs, push lhs * rhs.
DIVIDE	Pop rhs, pop lhs, push lhs / rhs.
MODULO	Pop rhs, pop lhs, push lhs % rhs.
NEGATIVE	Pop val, push negative val.
NOT	Pop val, push logical not of val.
LT	Pop rhs, pop lhs, push lhs < rhs.
LTE	Pop rhs, pop lhs, push lhs <= rhs.
GT	Pop rhs, pop lhs, push lhs > rhs.
GTE	Pop rhs, pop lhs, push lhs >= rhs.
EQ	Pop rhs, pop lhs, push lhs == rhs.
NEQ	Pop rhs, pop lhs, push lhs != rhs.
INDEX	Pop index, pop collection, push collection[index].
CASTINTEGER	Pop a val, typecast to int, push.
CASTFLOAT	Pop a val, typecast to float, push.
CASTBOOLEAN	Pop a val, typecast to boolean, push.
CALLFUNC	Get argc, Pop a function, execute function if argc matches.
RETURN	Get stack #, pop return val, pop (stack #) times, push val, restore fp, restore pc.
PRINT	Pop val, print(val), push error or NULL.

## 6.38 include/program.hpp File Reference

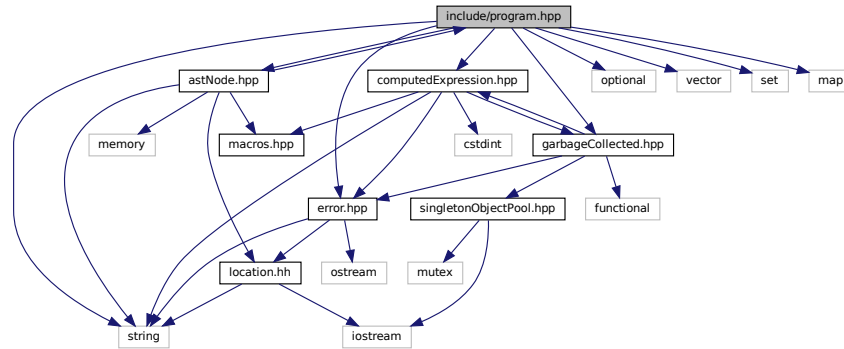
Declare the [Tang::Program](#) class used to compile and execute source code.

```
#include <string>
#include <optional>
#include <vector>
```

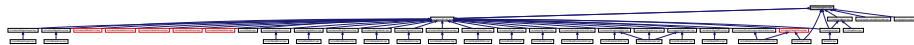


```
#include <set>
#include <map>
#include "astNode.hpp"
#include "error.hpp"
#include "computedExpression.hpp"
#include "garbageCollected.hpp"
```

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.*

### 6.38.1 Detailed Description

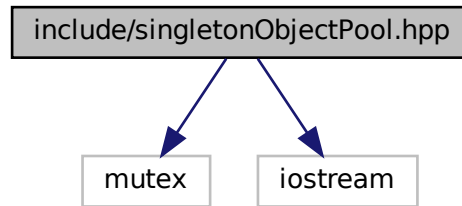
Declare the [Tang::Program](#) class used to compile and execute source code.

## 6.39 include/singletonObjectPool.hpp File Reference

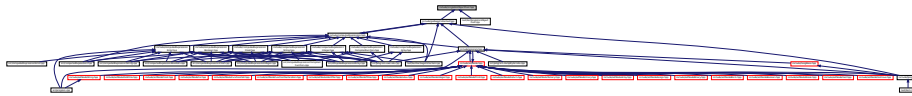
Declare the [Tang::SingletonObjectPool](#) class.

```
#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.*

#### 6.39.1 Detailed Description

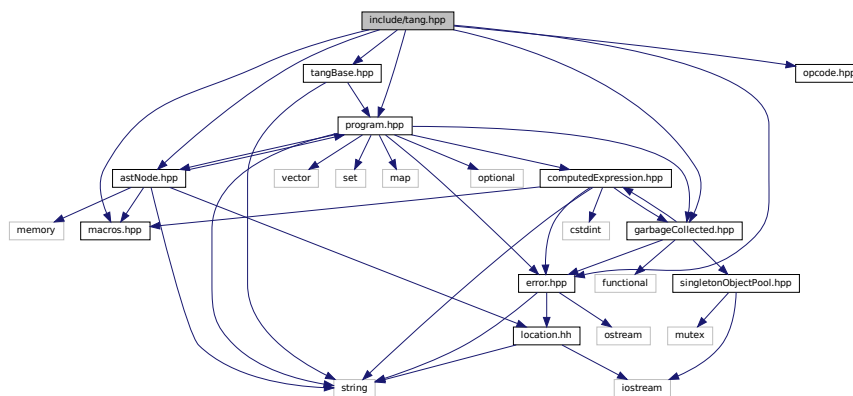
Declare the [Tang::SingletonObjectPool](#) class.

## 6.40 include/tang.hpp File Reference

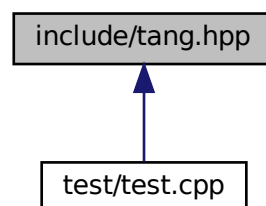
Header file supplied for use by 3rd party code so that they can easily include all necessary headers.

```
#include "macros.hpp"
#include "tangBase.hpp"
#include "astNode.hpp"
#include "error.hpp"
#include "garbageCollected.hpp"
#include "program.hpp"
#include "opcode.hpp"
```

Include dependency graph for tang.hpp:



This graph shows which files directly or indirectly include this file:



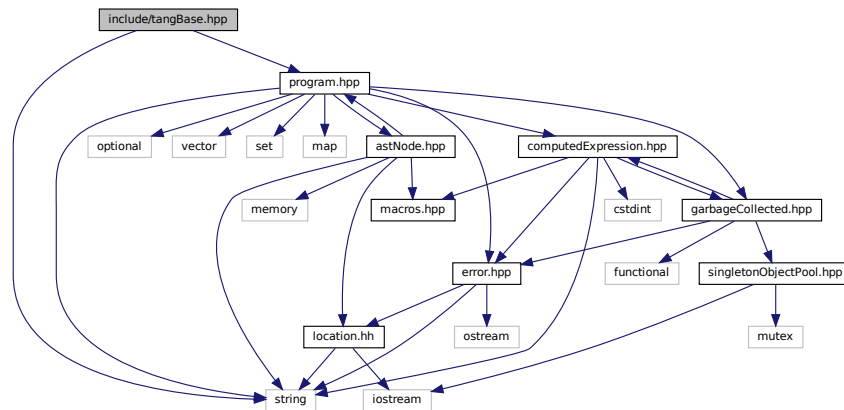
### 6.40.1 Detailed Description

Header file supplied for use by 3rd party code so that they can easily include all necessary headers.

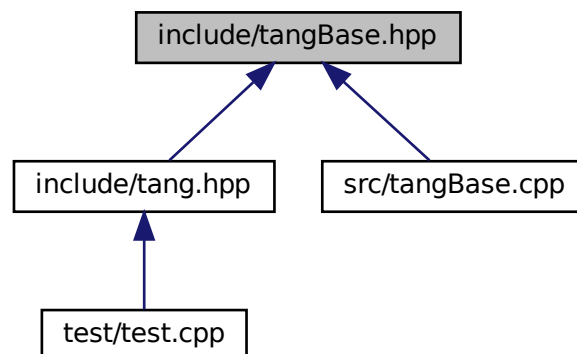
## 6.41 include/tangBase.hpp File Reference

Declare the [Tang::TangBase](#) class used to interact with Tang.

```
#include <string>
#include "program.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.*

### 6.41.1 Detailed Description

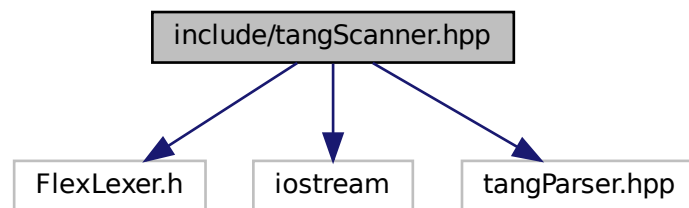
Declare the [Tang::TangBase](#) class used to interact with Tang.

## 6.42 include/tangScanner.hpp File Reference

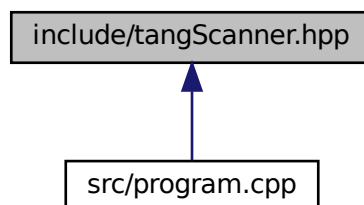
Declare the [Tang::TangScanner](#) used to tokenize a Tang script.

```
#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\(\)](#)

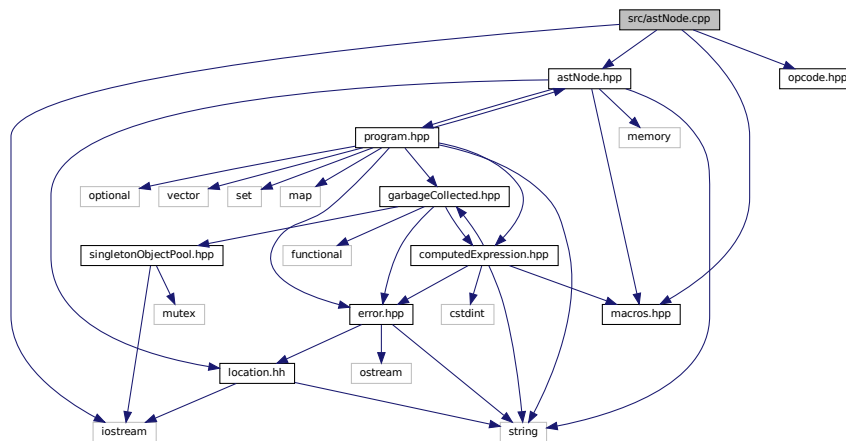
### 6.42.1 Detailed Description

Declare the [Tang::TangScanner](#) used to tokenize a Tang script.

## 6.43 src/astNode.cpp File Reference

Define the [Tang::AstNode](#) class.

```
#include <iostream>
#include "macros.hpp"
#include "astNode.hpp"
#include "opcode.hpp"
Include dependency graph for astNode.cpp:
```



### 6.43.1 Detailed Description

Define the [Tang::AstNode](#) class.

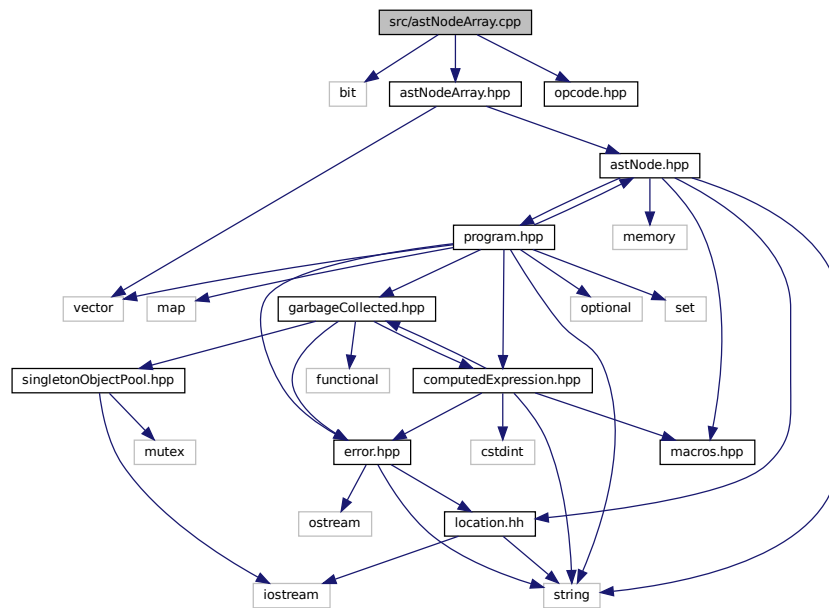
## 6.44 src/astNodeArray.cpp File Reference

Define the [Tang::AstNodeArray](#) class.

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

```
#include "opcode.hpp"
```

Include dependency graph for astNodeArray.cpp:



### 6.44.1 Detailed Description

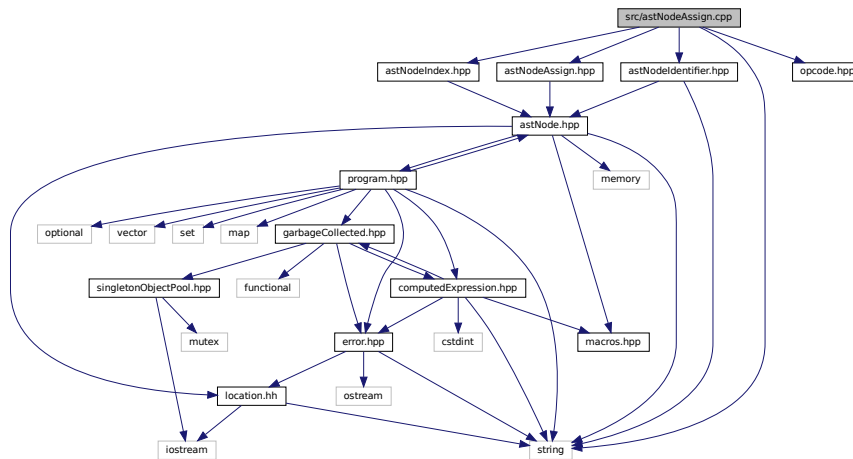
Define the [Tang::AstNodeArray](#) class.

## 6.45 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 dependency graph for `astNodeAssign.cpp`:



### 6.45.1 Detailed Description

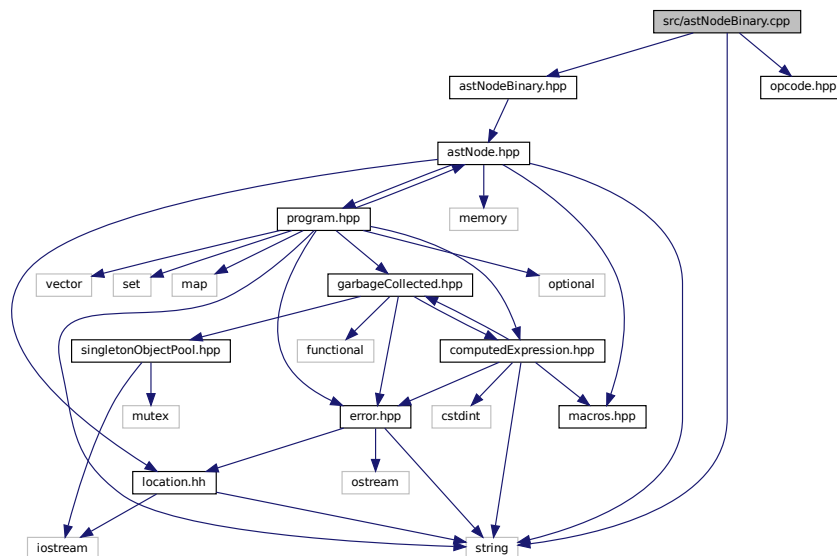
Define the [Tang::AstNodeAssign](#) class.

## 6.46 src/astNodeBinary.cpp File Reference

Define the [Tang::AstNodeBinary](#) class.

```
#include <string>
#include "astNodeBinary.hpp"
#include "opcode.hpp"
```

Include dependency graph for `astNodeBinary.cpp`:





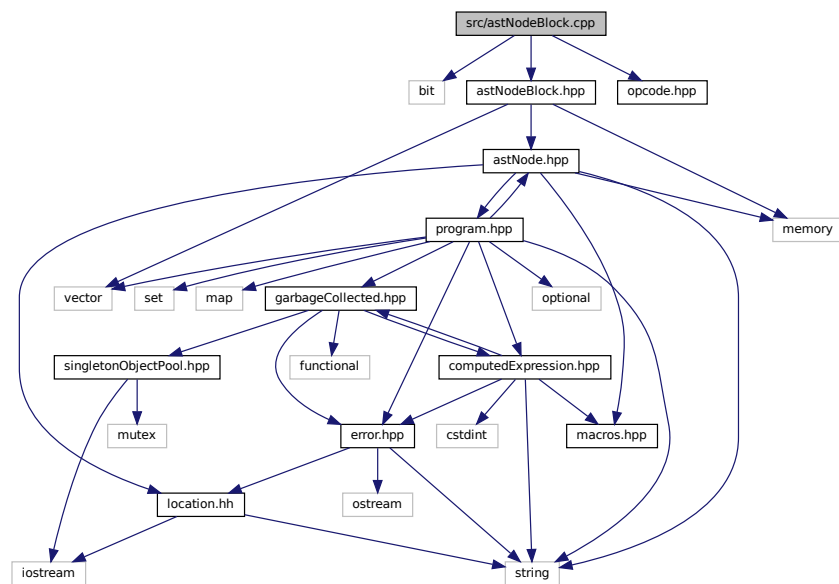
### 6.46.1 Detailed Description

Define the [Tang::AstNodeBinary](#) class.

## 6.47 src/astNodeBlock.cpp File Reference

Define the [Tang::AstNodeBlock](#) class.

```
#include <bit>
#include "astNodeBlock.hpp"
#include "opcode.hpp"
Include dependency graph for astNodeBlock.cpp:
```



### 6.47.1 Detailed Description

Define the [Tang::AstNodeBlock](#) class.

## 6.48 src/astNodeBoolean.cpp File Reference

Define the [Tang::AstNodeBoolean](#) class.

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



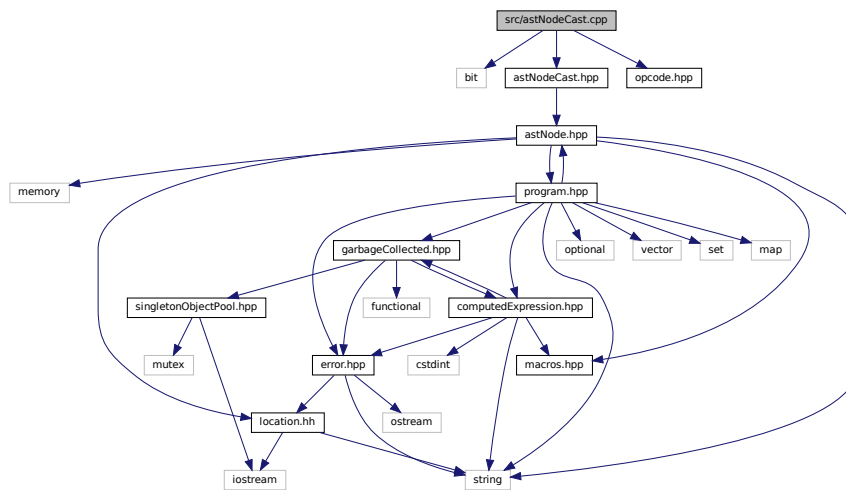
### 6.49.1 Detailed Description

Define the [Tang::AstNodeBreak](#) class.

## 6.50 src/astNodeCast.cpp File Reference

Define the [Tang::AstNodeCast](#) class.

```
#include <bit>
#include "astNodeCast.hpp"
#include "opcode.hpp"
Include dependency graph for astNodeCast.cpp:
```



### 6.50.1 Detailed Description

Define the [Tang::AstNodeCast](#) class.

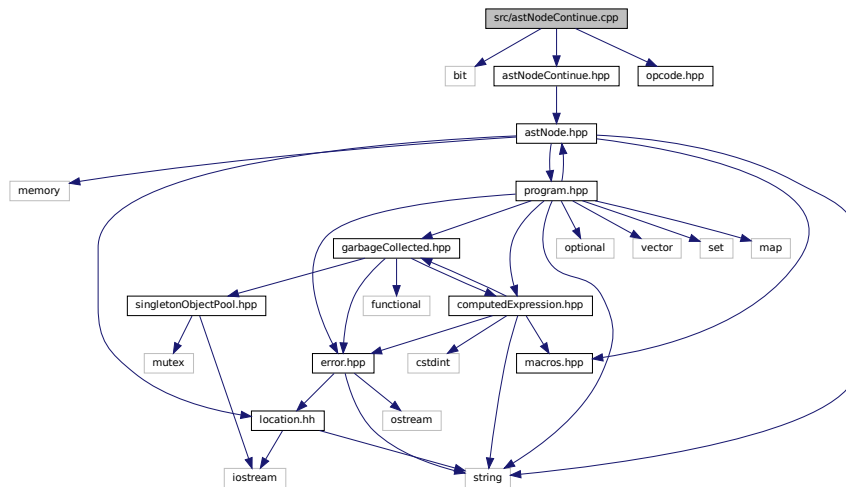
## 6.51 src/astNodeContinue.cpp File Reference

Define the [Tang::AstNodeContinue](#) class.

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

```
#include "opcode.hpp"
```

Include dependency graph for `astNodeContinue.cpp`:



### 6.51.1 Detailed Description

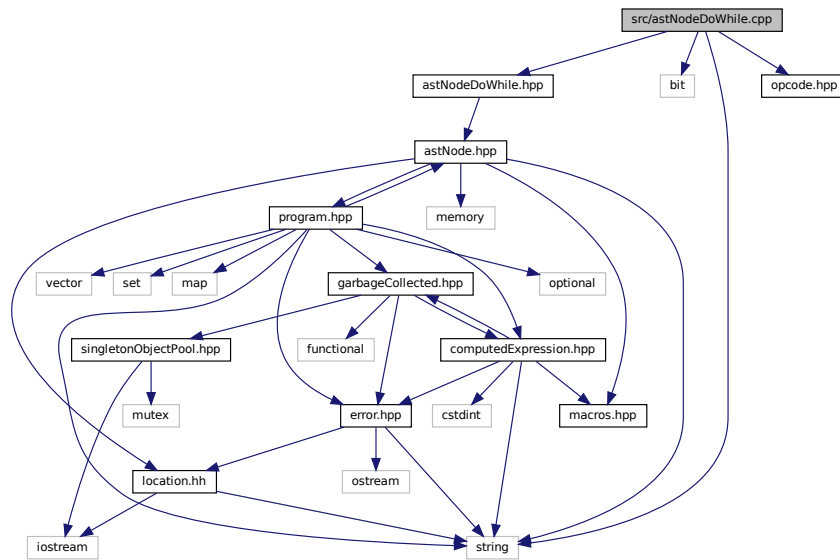
Define the [Tang::AstNodeContinue](#) class.

## 6.52 src/astNodeDoWhile.cpp File Reference

Define the [Tang::AstNodeDoWhile](#) class.

```
#include <string>
#include <bit>
#include "astNodeDoWhile.hpp"
#include "opcode.hpp"
```

Include dependency graph for astNodeDoWhile.cpp:



### 6.52.1 Detailed Description

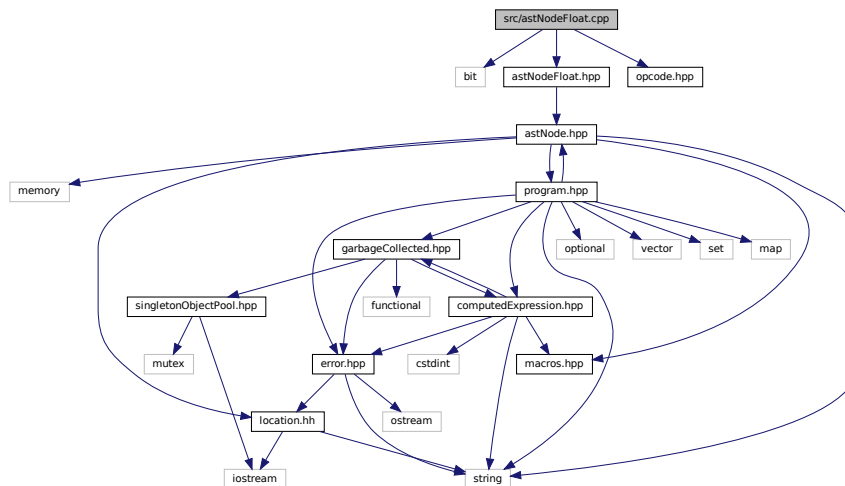
Define the [Tang::AstNodeDoWhile](#) class.

## 6.53 src/astNodeFloat.cpp File Reference

Define the [Tang::AstNodeFloat](#) class.

```
#include <bit>
#include "astNodeFloat.hpp"
#include "opcode.hpp"
```

Include dependency graph for astNodeFloat.cpp:



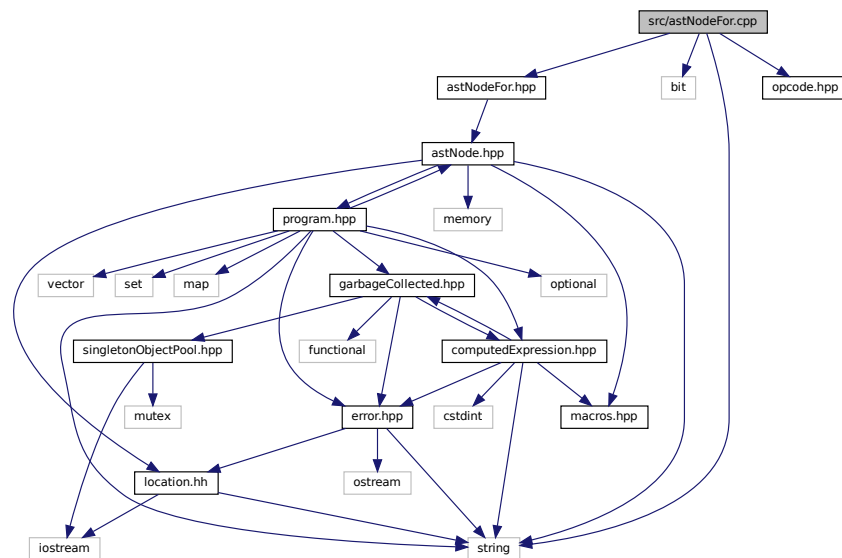
### 6.53.1 Detailed Description

Define the [Tang::AstNodeFloat](#) class.

## 6.54 src/astNodeFor.cpp File Reference

Define the [Tang::AstNodeFor](#) class.

```
#include <string>
#include <bit>
#include "astNodeFor.hpp"
#include "opcode.hpp"
Include dependency graph for astNodeFor.cpp:
```



### 6.54.1 Detailed Description

Define the [Tang::AstNodeFor](#) class.

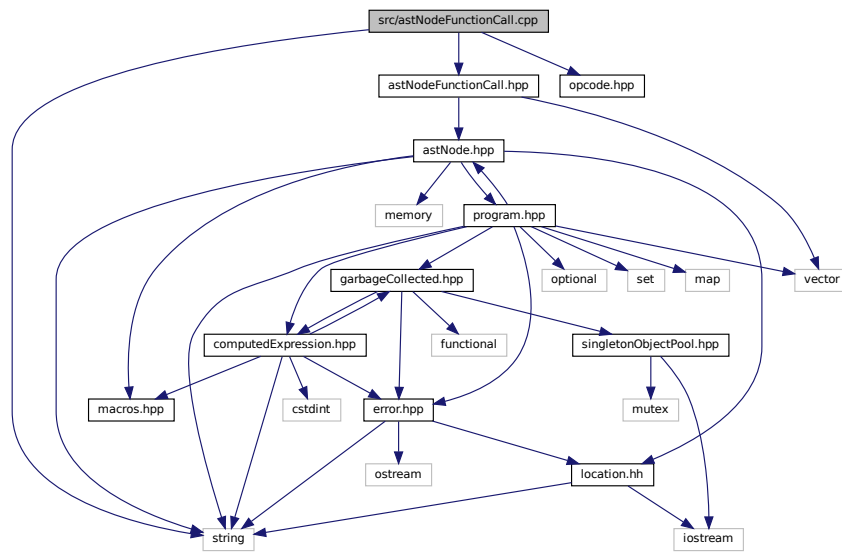
## 6.55 src/astNodeFunctionCall.cpp File Reference

Define the [Tang::AstNodeFunctionCall](#) class.

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

```
#include "opcode.hpp"
```

Include dependency graph for astNodeFunctionCall.cpp:



### 6.55.1 Detailed Description

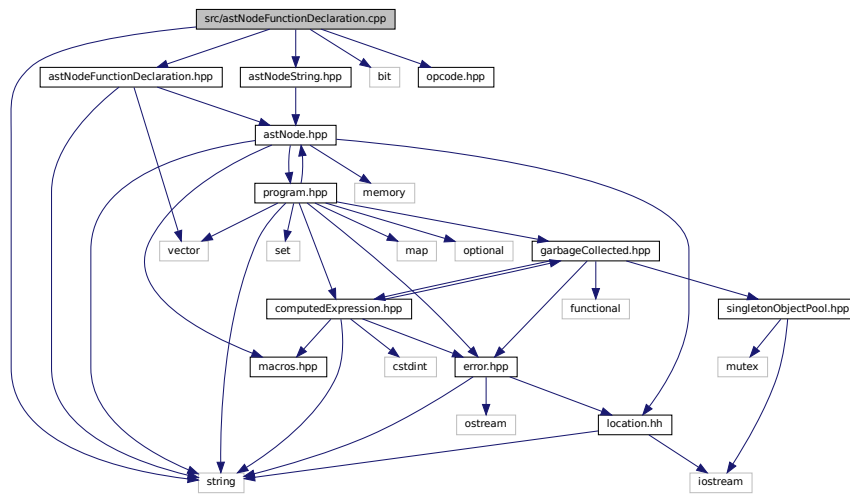
Define the [Tang::AstNodeFunctionCall](#) class.

## 6.56 src/astNodeFunctionDeclaration.cpp File Reference

Define the [Tang::AstNodeFunctionDeclaration](#) class.

```
#include <string>
#include <bit>
#include "astNodeFunctionDeclaration.hpp"
#include "astNodeString.hpp"
#include "opcode.hpp"
```

Include dependency graph for `astNodeFunctionDeclaration.cpp`:



### 6.56.1 Detailed Description

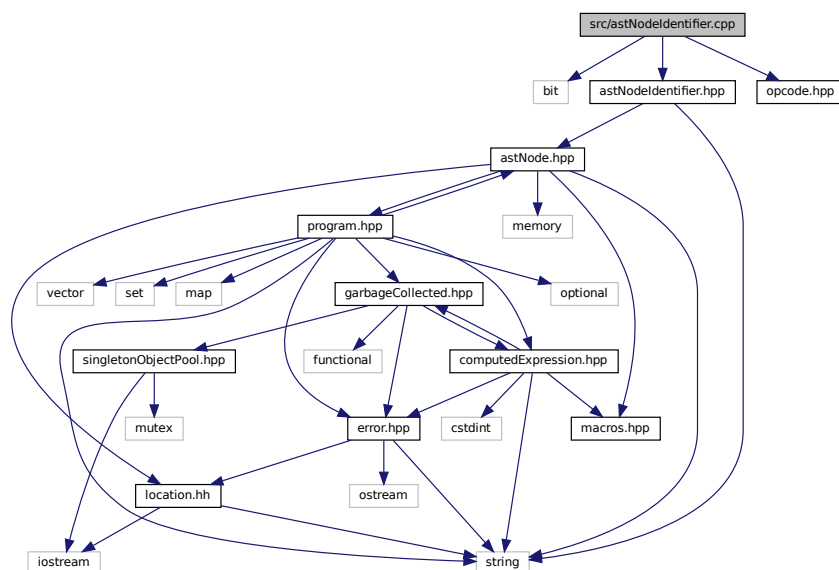
Define the [Tang::AstNodeFunctionDeclaration](#) class.

## 6.57 src/astNodeIdentifier.cpp File Reference

Define the [Tang::AstNodeIdentifier](#) class.

```
#include <bit>
#include "astNodeIdentifier.hpp"
#include "opcode.hpp"
```

Include dependency graph for `astNodeIdentifier.cpp`:





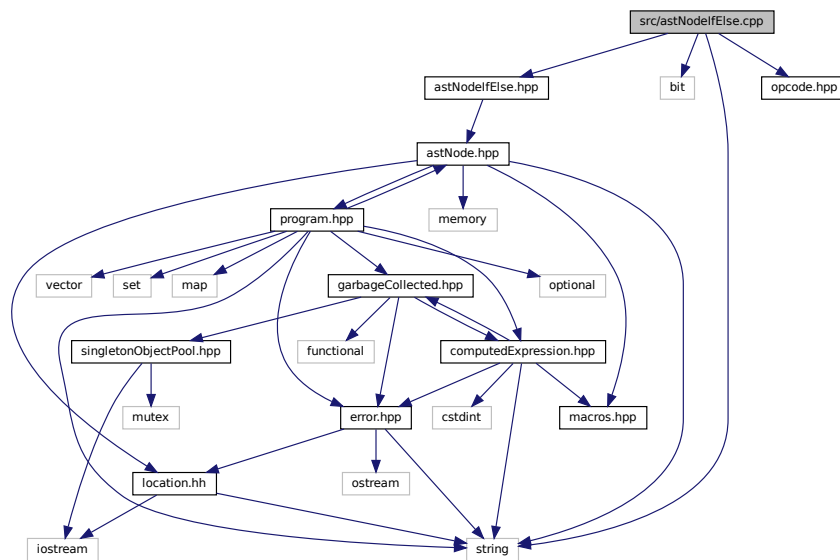
### 6.57.1 Detailed Description

Define the [Tang::AstNodeIdentifier](#) class.

## 6.58 src/astNodeIfElse.cpp File Reference

Define the [Tang::AstNodeIfElse](#) class.

```
#include <string>
#include <bit>
#include "astNodeIfElse.hpp"
#include "opcode.hpp"
Include dependency graph for astNodeIfElse.cpp:
```



### 6.58.1 Detailed Description

Define the [Tang::AstNodeIfElse](#) class.

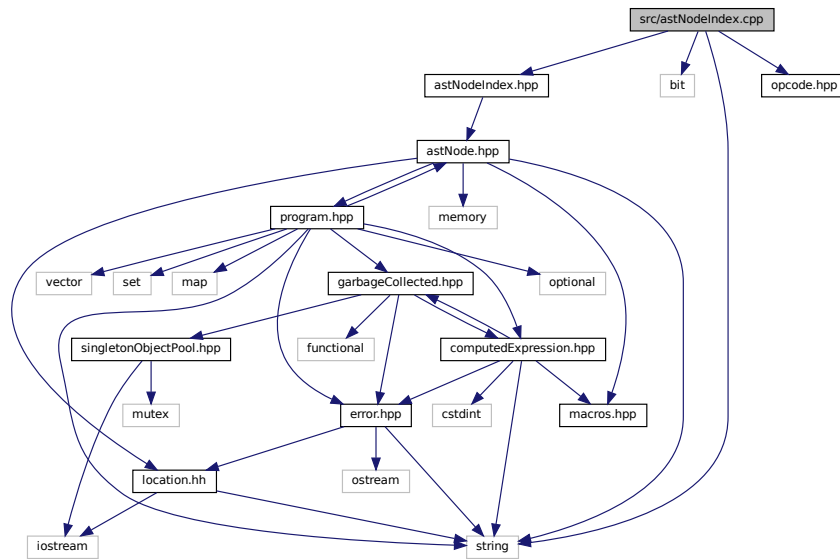
## 6.59 src/astNodeIndex.cpp File Reference

Define the [Tang::AstNodeIndex](#) class.

```
#include <string>
#include <bit>
#include "astNodeIndex.hpp"
```

```
#include "opcode.hpp"
```

Include dependency graph for astNodeIndex.cpp:



### 6.59.1 Detailed Description

Define the [Tang::AstNodeIndex](#) class.

## 6.60 src/astNodeInteger.cpp File Reference

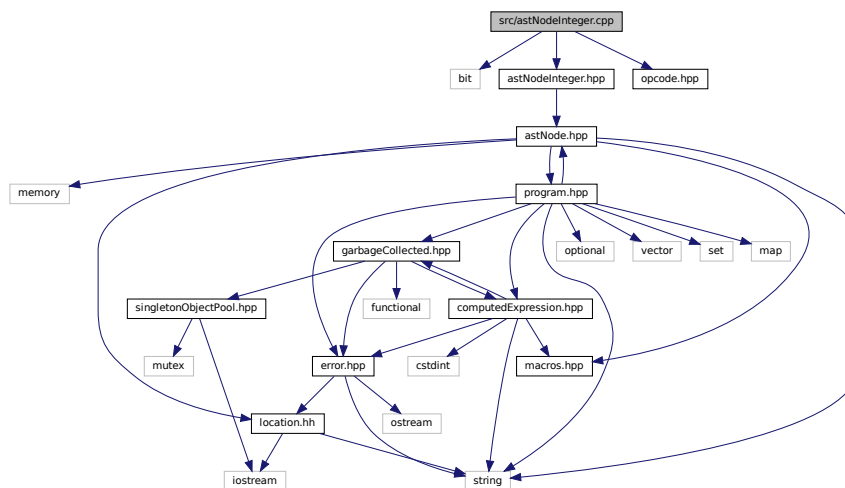
Define the [Tang::AstNodeInteger](#) class.

```
#include <bit>
```

```
#include "astNodeInteger.hpp"
```

```
#include "opcode.hpp"
```

Include dependency graph for astNodeInteger.cpp:



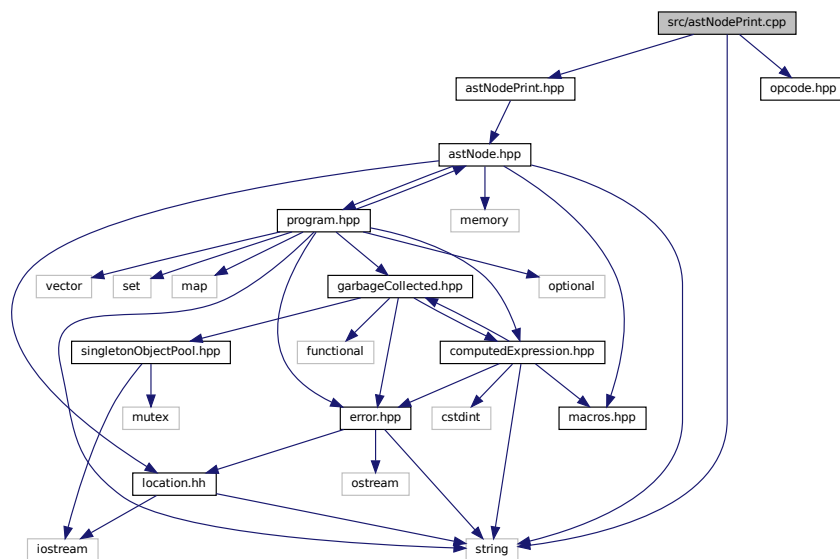
### 6.60.1 Detailed Description

Define the [Tang::AstNodeInteger](#) class.

## 6.61 src/astNodePrint.cpp File Reference

Define the [Tang::AstNodePrint](#) class.

```
#include <string>
#include "astNodePrint.hpp"
#include "opcode.hpp"
Include dependency graph for astNodePrint.cpp:
```



### 6.61.1 Detailed Description

Define the [Tang::AstNodePrint](#) class.

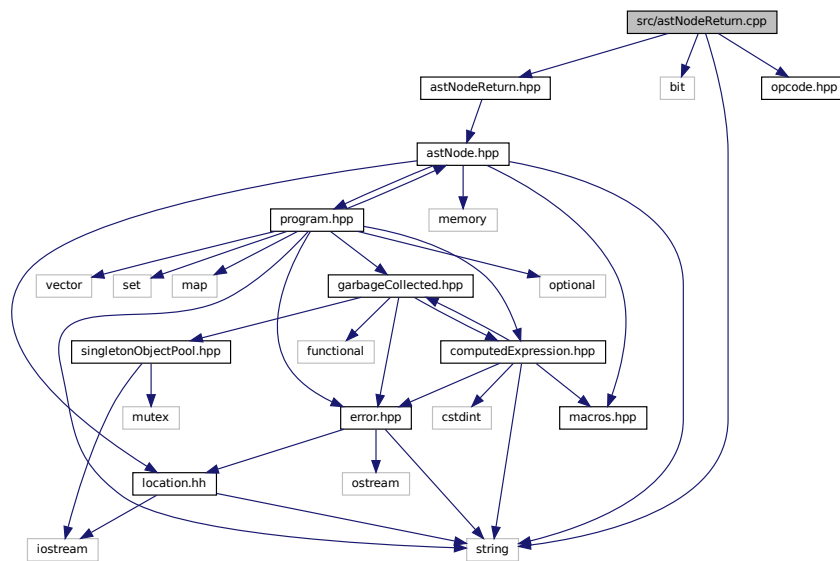
## 6.62 src/astNodeReturn.cpp File Reference

Define the [Tang::AstNodeReturn](#) class.

```
#include <string>
#include <bit>
#include "astNodeReturn.hpp"
```

```
#include "opcode.hpp"
```

Include dependency graph for astNodeReturn.cpp:



### 6.62.1 Detailed Description

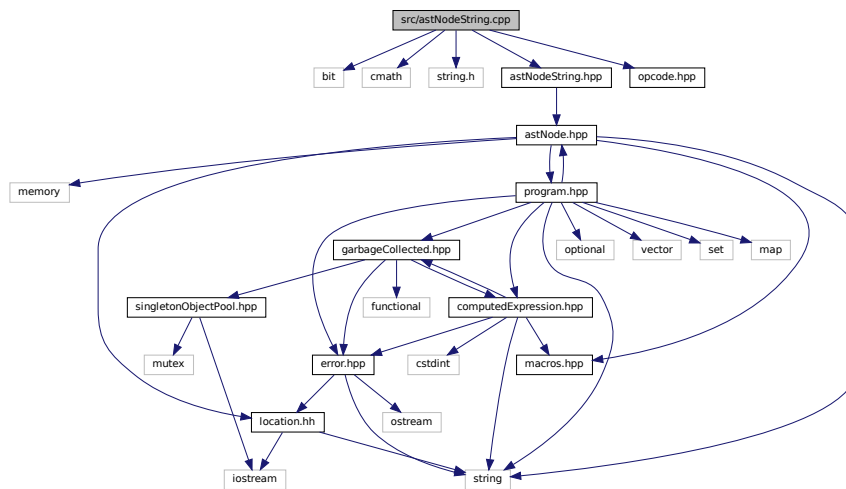
Define the [Tang::AstNodeReturn](#) class.

## 6.63 src/astNodeString.cpp File Reference

Define the [Tang::AstNodeString](#) class.

```
#include <bit>
#include <cmath>
#include <string.h>
#include "astNodeString.hpp"
#include "opcode.hpp"
```

Include dependency graph for astNodeString.cpp:



### 6.63.1 Detailed Description

Define the [Tang::AstNodeString](#) class.

## 6.64 src/astNodeTernary.cpp File Reference

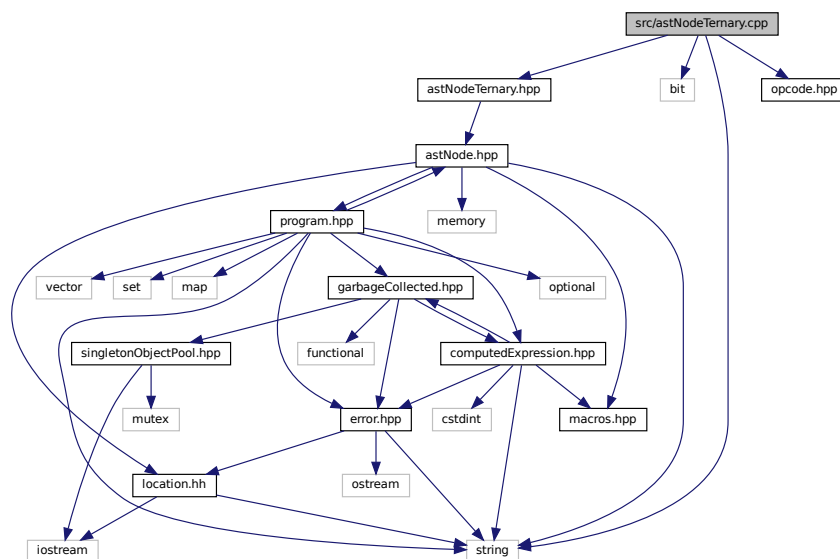
Define the [Tang::AstNodeTernary](#) class.

```

#include <string>
#include <bit>
#include "astNodeTernary.hpp"
#include "opcode.hpp"

```

Include dependency graph for astNodeTernary.cpp:



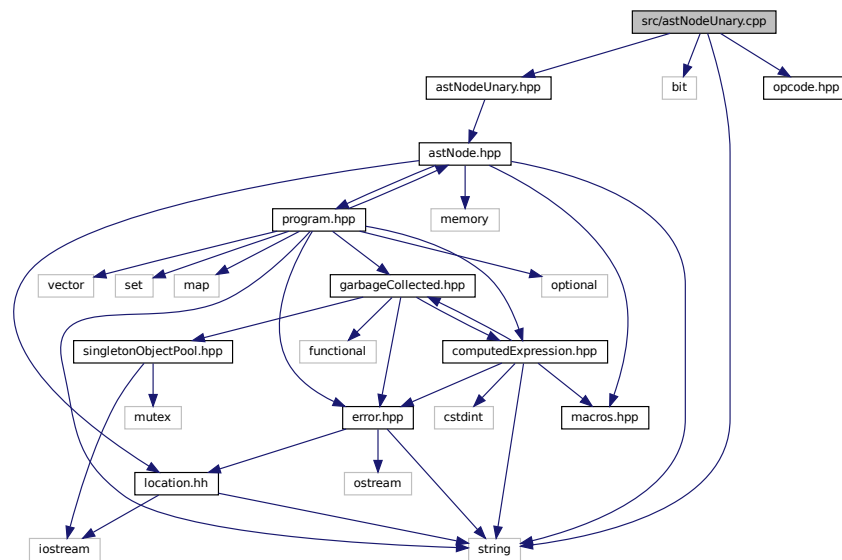
### 6.64.1 Detailed Description

Define the [Tang::AstNodeUnary](#) class.

## 6.65 src/astNodeUnary.cpp File Reference

Define the [Tang::AstNodeUnary](#) class.

```
#include <string>
#include <bit>
#include "astNodeUnary.hpp"
#include "opcode.hpp"
Include dependency graph for astNodeUnary.cpp:
```



### 6.65.1 Detailed Description

Define the [Tang::AstNodeUnary](#) class.

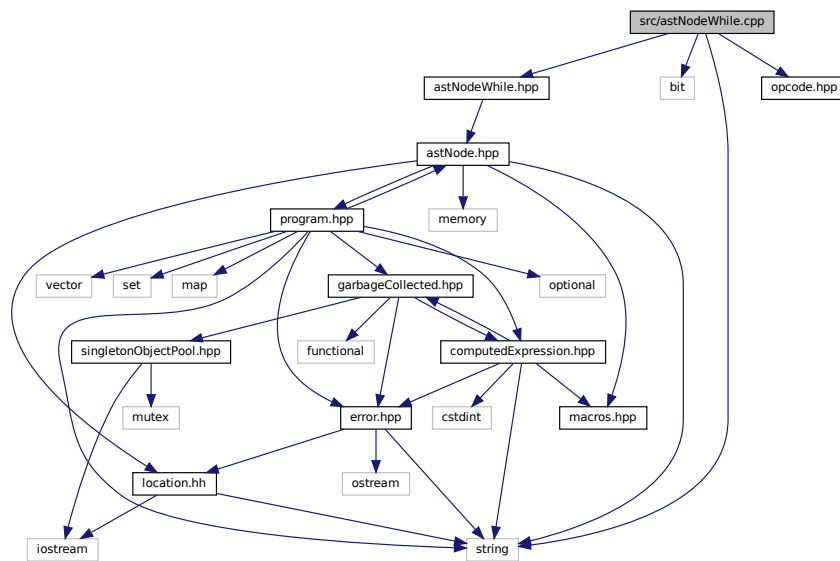
## 6.66 src/astNodeWhile.cpp File Reference

Define the [Tang::AstNodeWhile](#) class.

```
#include <string>
#include <bit>
#include "astNodeWhile.hpp"
```

```
#include "opcode.hpp"
```

Include dependency graph for astNodeWhile.cpp:



### 6.66.1 Detailed Description

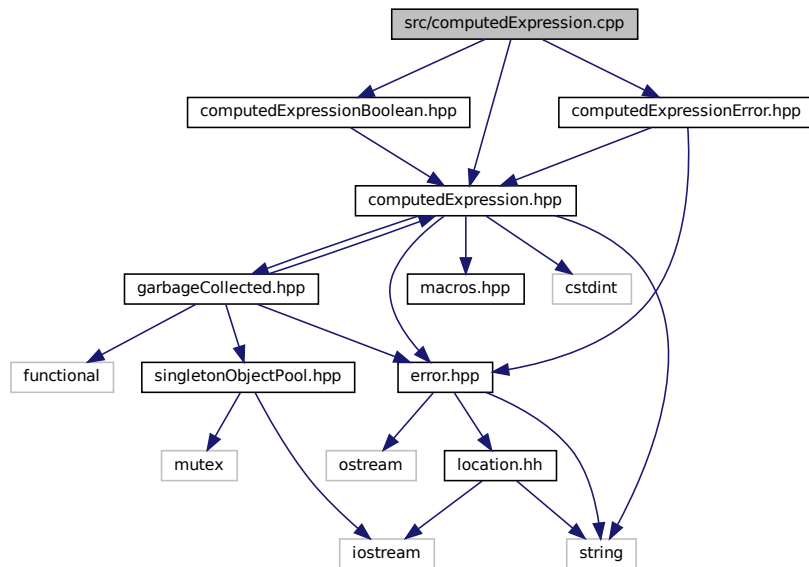
Define the [Tang::AstNodeWhile](#) class.

## 6.67 src/computedExpression.cpp File Reference

Define the [Tang::ComputedExpression](#) class.

```
#include "computedExpression.hpp"
#include "computedExpressionBoolean.hpp"
#include "computedExpressionError.hpp"
```

Include dependency graph for `computedExpression.cpp`:



### 6.67.1 Detailed Description

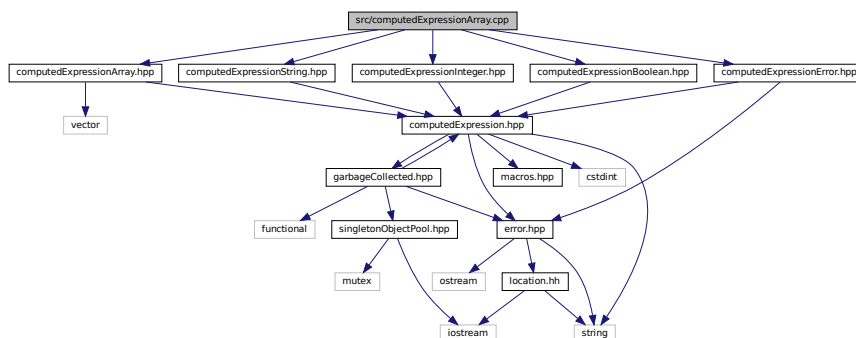
Define the [Tang::ComputedExpression](#) class.

## 6.68 src/computedExpressionArray.cpp File Reference

Define the [Tang::ComputedExpressionArray](#) class.

```
#include "computedExpressionArray.hpp"
#include "computedExpressionInteger.hpp"
#include "computedExpressionBoolean.hpp"
#include "computedExpressionString.hpp"
#include "computedExpressionError.hpp"
```

Include dependency graph for `computedExpressionArray.cpp`:





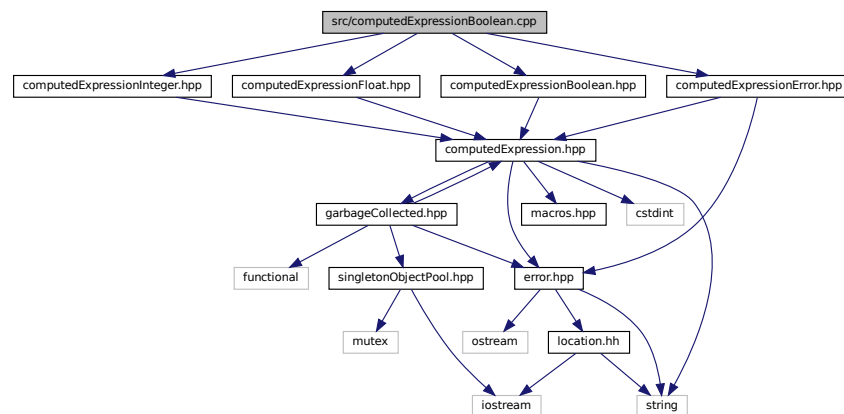
### 6.68.1 Detailed Description

Define the [Tang::ComputedExpressionArray](#) class.

## 6.69 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:
```



### 6.69.1 Detailed Description

Define the [Tang::ComputedExpressionBoolean](#) class.

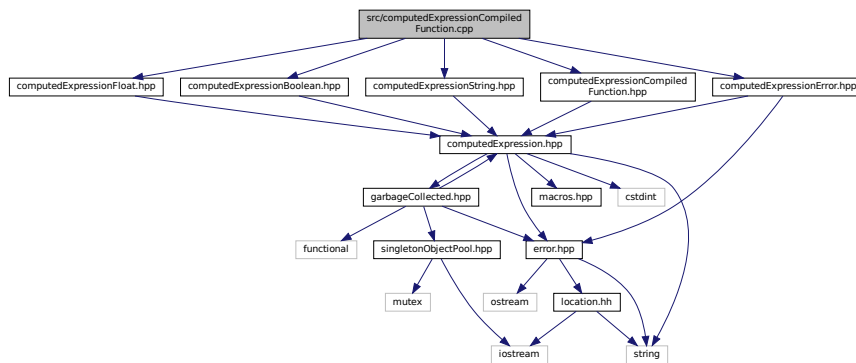
## 6.70 src/computedExpressionCompiledFunction.cpp File Reference

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`:



### 6.70.1 Detailed Description

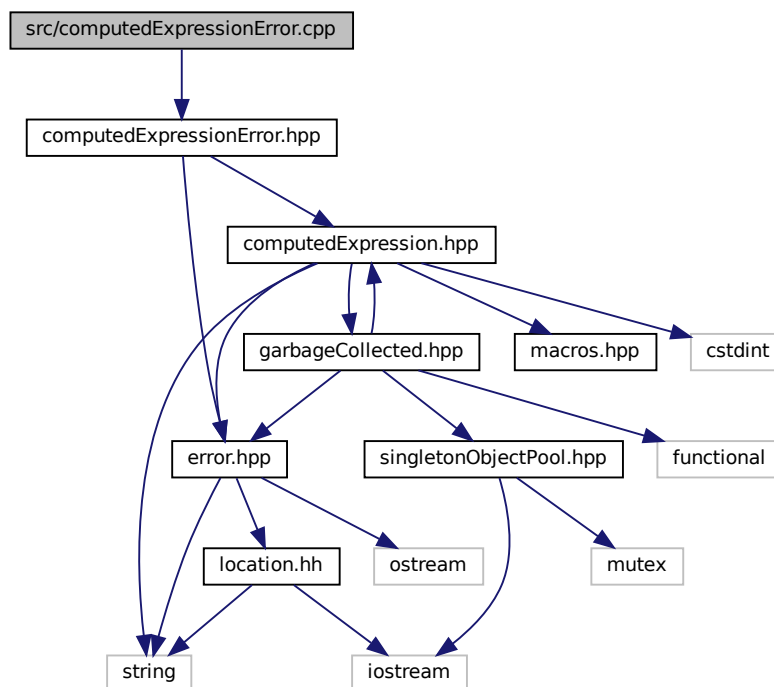
Define the [Tang::ComputedExpressionCompiledFunction](#) class.

## 6.71 src/computedExpressionError.cpp File Reference

Define the [Tang::ComputedExpressionError](#) class.

```
#include "computedExpressionError.hpp"
```

Include dependency graph for `computedExpressionError.cpp`:



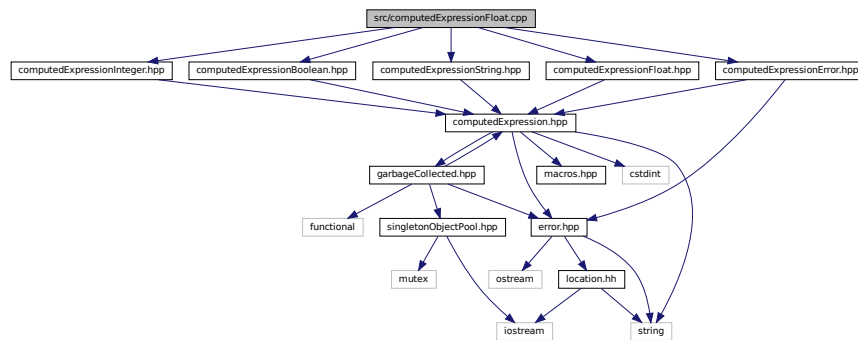
### 6.71.1 Detailed Description

Define the [Tang::ComputedExpressionError](#) class.

## 6.72 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:
```



### 6.72.1 Detailed Description

Define the [Tang::ComputedExpressionFloat](#) class.

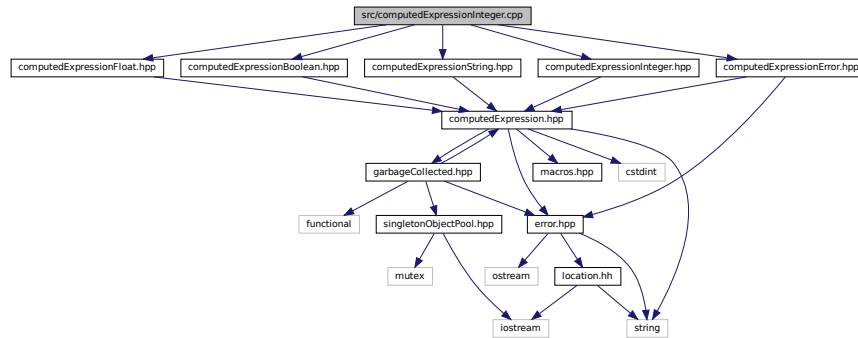
## 6.73 src/computedExpressionInteger.cpp File Reference

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`:



### 6.73.1 Detailed Description

Define the [Tang::ComputedExpressionInteger](#) class.

## 6.74 src/computedExpressionString.cpp File Reference

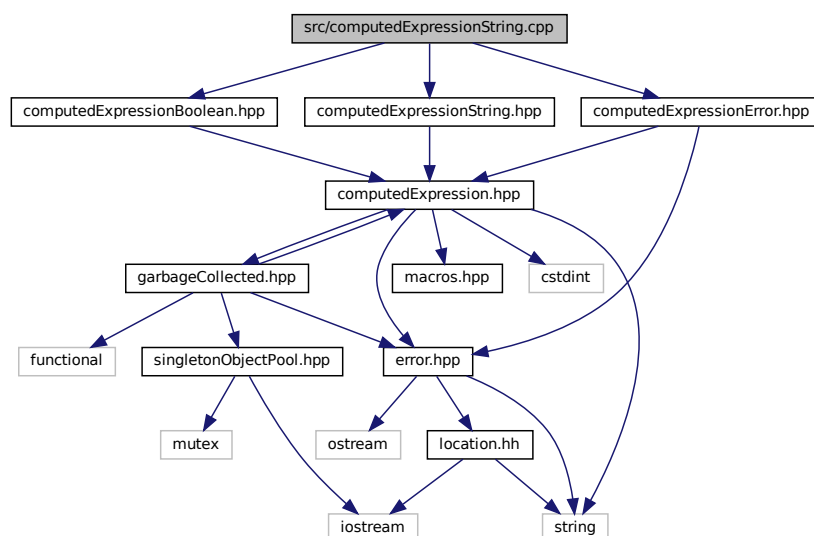
Define the [Tang::ComputedExpressionString](#) class.

```
#include "computedExpressionString.hpp"
```

```
#include "computedExpressionBoolean.hpp"
```

```
#include "computedExpressionError.hpp"
```

Include dependency graph for `computedExpressionString.cpp`:



### 6.74.1 Detailed Description

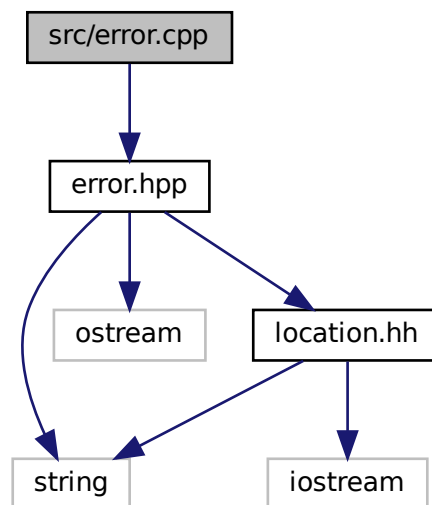
Define the [Tang::ComputedExpressionString](#) class.

## 6.75 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)`

### 6.75.1 Detailed Description

Define the [Tang::Error](#) class.

### 6.75.2 Function Documentation

#### 6.75.2.1 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

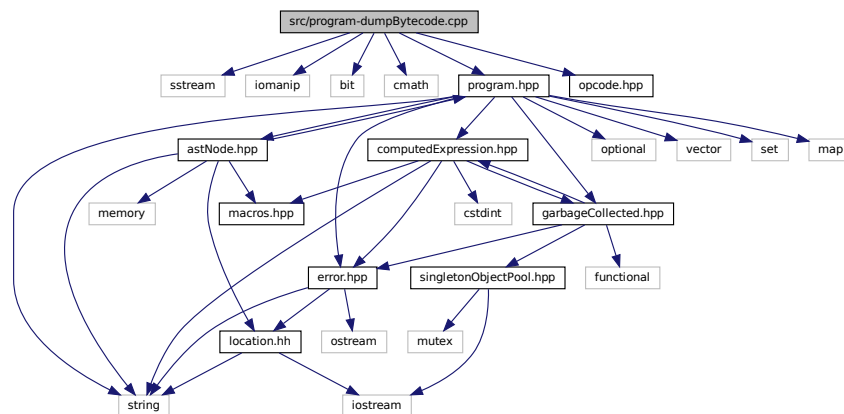
The output stream.

## 6.76 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.

#### 6.76.1 Detailed Description

Define the [Tang::Program::dumpBytecode](#) method.

#### 6.76.2 Macro Definition Documentation

## 6.76.2.1 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**

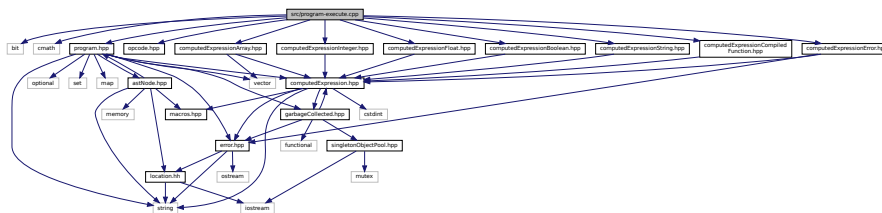
x	The number of additional vector entries that should exist.
---	--

## 6.77 src/program-execute.cpp File Reference

Define the `Tang::Program::execute` method.

```
#include <bit>
#include <cmath>
#include "program.hpp"
#include "opcode.hpp"
#include "computedExpressionError.hpp"
#include "computedExpressionInteger.hpp"
#include "computedExpressionFloat.hpp"
#include "computedExpressionBoolean.hpp"
#include "computedExpressionString.hpp"
#include "computedExpressionArray.hpp"
#include "computedExpressionCompiledFunction.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.

### 6.77.1 Detailed Description

Define the [Tang::Program::execute](#) method.

### 6.77.2 Macro Definition Documentation

#### 6.77.2.1 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.
---	--

#### 6.77.2.2 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.
---	---

## 6.78 src/program.cpp File Reference

Define the [Tang::Program](#) class.

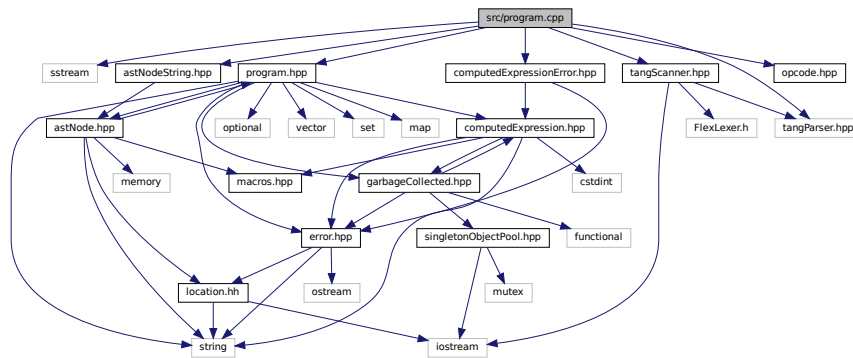


```

#include <sstream>
#include "program.hpp"
#include "opcode.hpp"
#include "tangScanner.hpp"
#include "tangParser.hpp"
#include "astNodeString.hpp"
#include "computedExpressionError.hpp"

```

Include dependency graph for program.cpp:



### 6.78.1 Detailed Description

Define the [Tang::Program](#) class.

## 6.79 src/tangBase.cpp File Reference

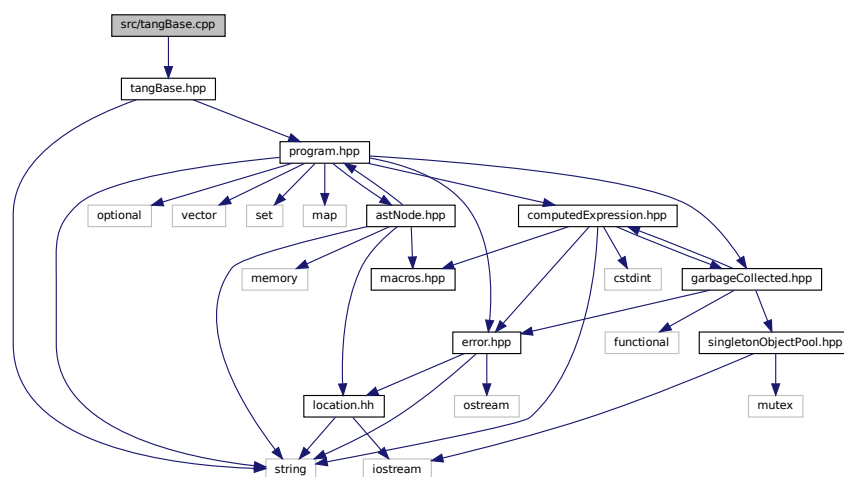
Define the [Tang::TangBase](#) class.

```

#include "tangBase.hpp"

```

Include dependency graph for tangBase.cpp:



### 6.79.1 Detailed Description

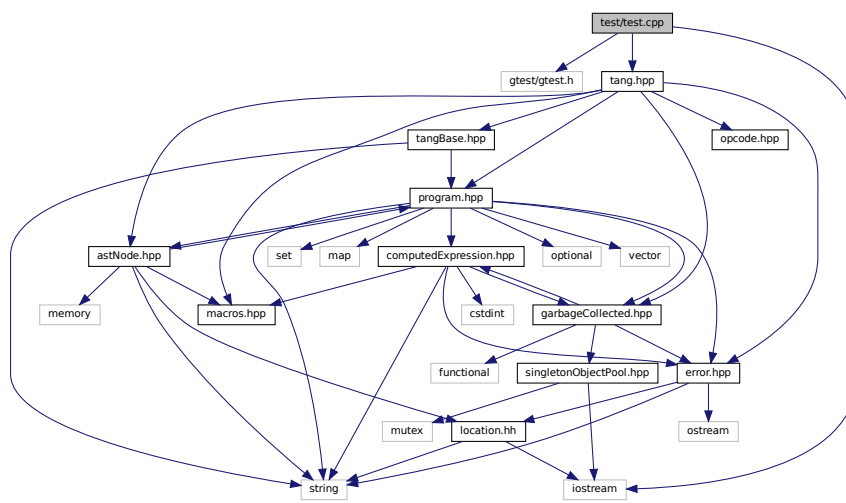
Define the [Tang::TangBase](#) class.

## 6.80 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, ArrayIndex)
- **TEST** (CodeBlock, Statements)
- **TEST** (Assign, Identifier)
- **TEST** (Assign, Index)
- **TEST** (ControlFlow, IfElse)
- **TEST** (ControlFlow, While)
- **TEST** (ControlFlow, Break)
- **TEST** (ControlFlow, Continue)
- **TEST** (ControlFlow, DoWhile)
- **TEST** (ControlFlow, For)
- **TEST** (Print, Default)
- **TEST** (Function, Compiled)
- **TEST** (Function, Recursion)
- **TEST** (Function, FunctionCall)
- **TEST** (Function, Return)
- **TEST** (Function, PassByValueVsRef)
- **int main** (int argc, char \*\*argv)

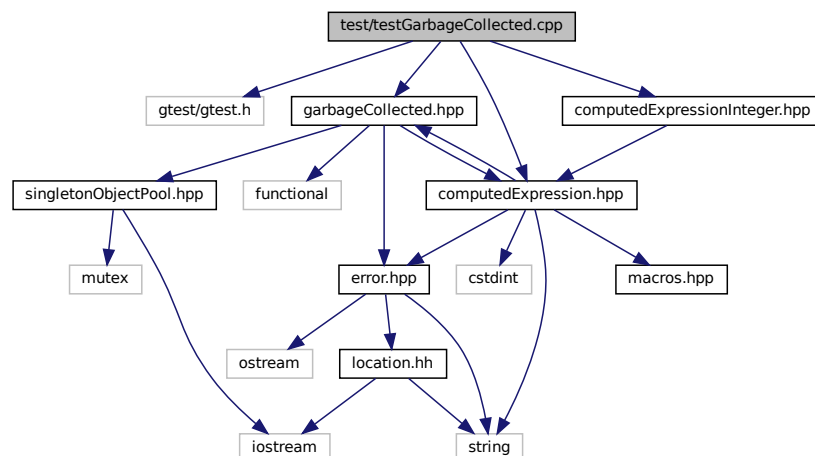
### 6.80.1 Detailed Description

Test the general language behaviors.

## 6.81 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)

### 6.81.1 Detailed Description

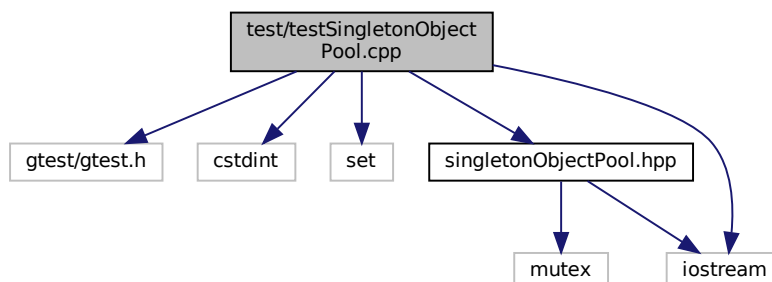
Test the generic behavior of the [Tang::GarbageCollected](#) class.

## 6.82 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)

### 6.82.1 Detailed Description

Test the generic behavior of the [Tang::SingletonObjectPool](#) class.

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