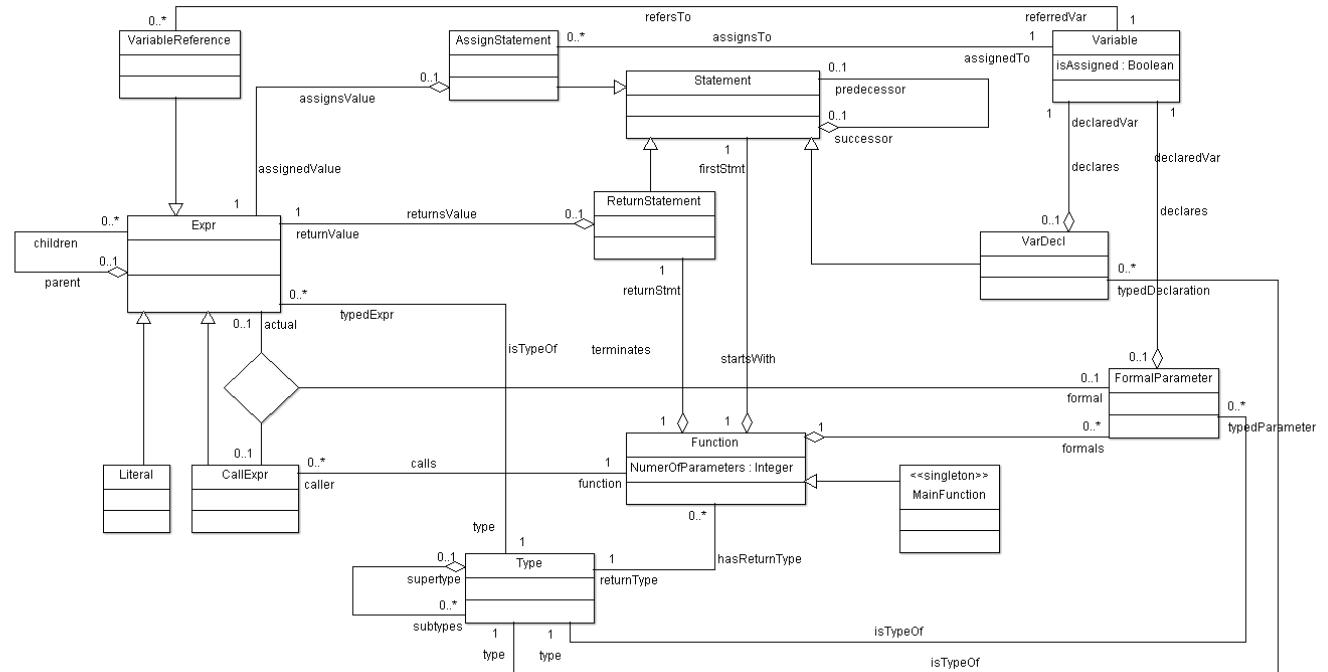


ETH SAE Project 1 - Sherlock

Source code and XML files are in `hand-in.zip`.

UML class diagram

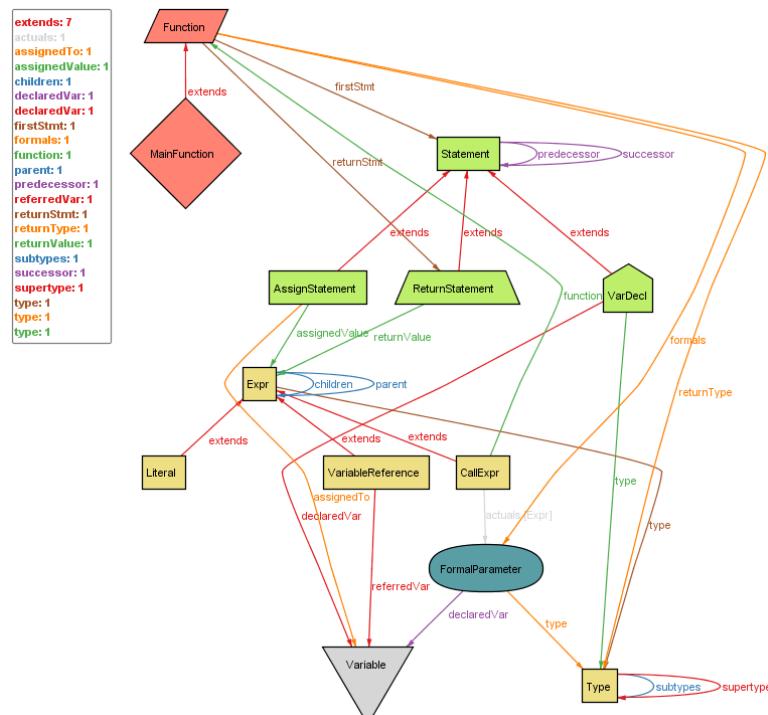


Elements that are not encodable in the UML class diagram

(The non-UML-encodable element is listed first. An optional explanation is in parentheses.)

- The first statement has no predecessor.
- The return statement has no successor.
- Actual parameters are mapped to formal parameters. (This would be done by a semantic analyser).
- Return statement terminates the execution.
- A function may not contain unreachable statements.
- Recursion is not allowed.
- The children of the call expression are in parent-child relation with the actual parameters.
- There is one main function that takes no parameters.
- All functions are transitively called from the main function.
- A variable has to be declared at least once. (We only modelled it has to be declared at most once)
- Variables must be declared in the same function before the first use such as the first assignment.
- Variables can only be used in expressions after they have been assigned to.
- We do not allow dead variables or dead assignments.
- There are no assignments to parameters.
- Typing rules for assignments, function calls and return statements.

Alloy model from task B



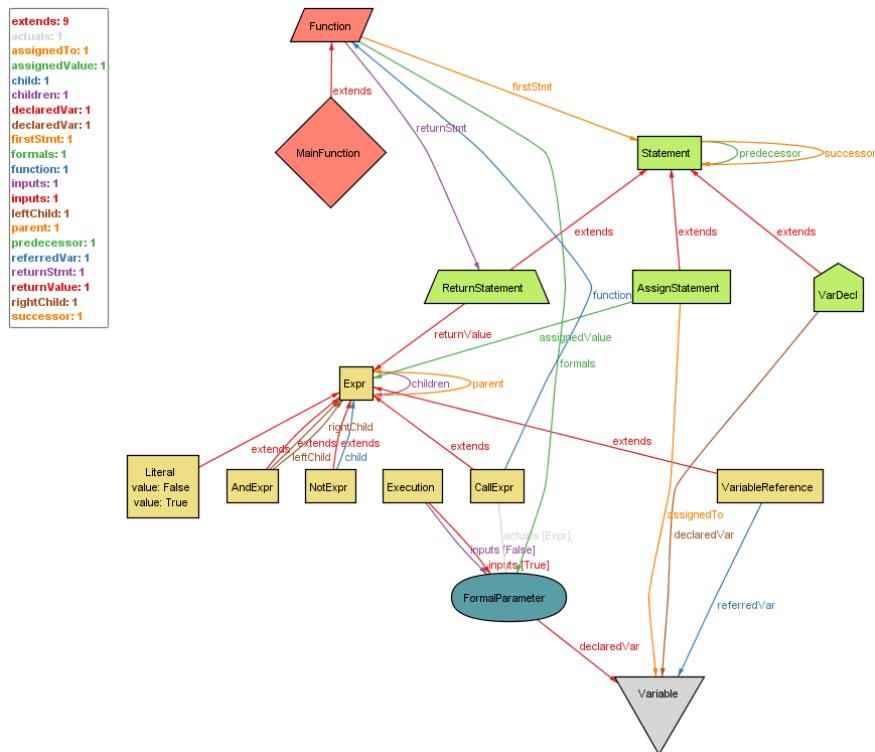
Elements that are not encodable in the Alloy model for task B

(The non-Alloy-encodable element is listed first. An optional explanation is in parentheses.)

- A return statement terminates the execution of the function body. (This is not a static constraint.)

- A function may not contain unreachable statements.

Alloy model from task D



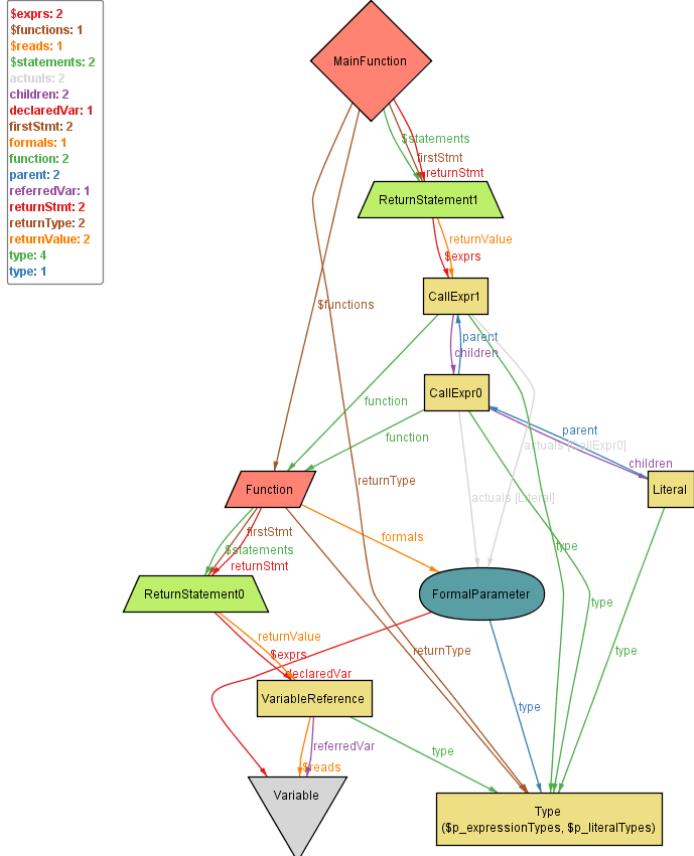
Instances that are not feasible in task C

- Instance 1 is not feasible since no recursion is allowed.
- Instance 5 is not feasible since we only have one literal yet two different types - and these two conditions cannot be fulfilled simultaneously.

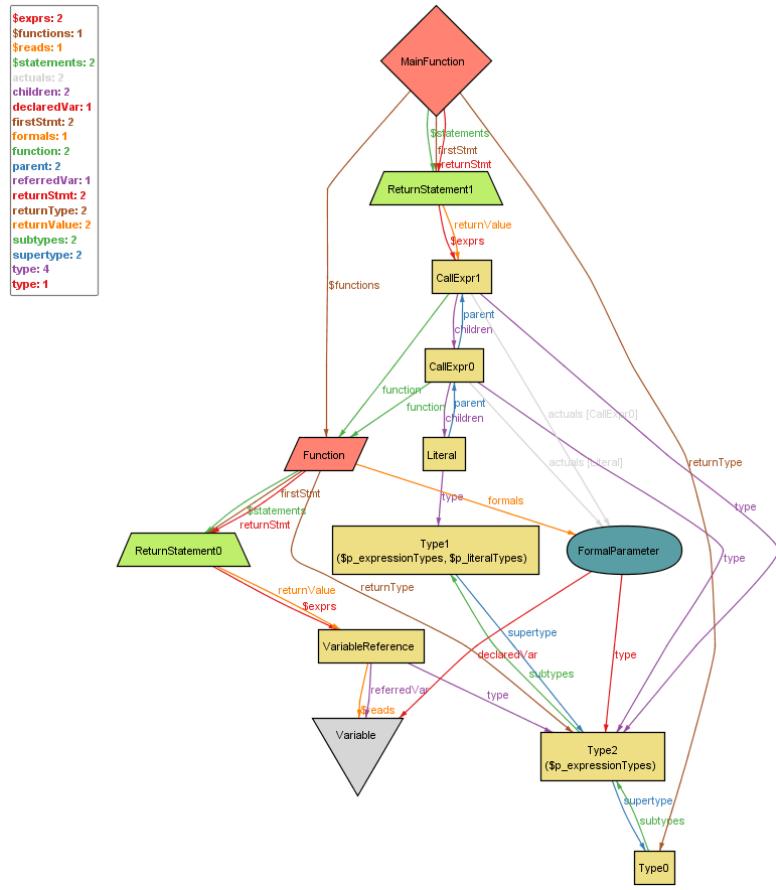
Image exports from task C

Instance 2

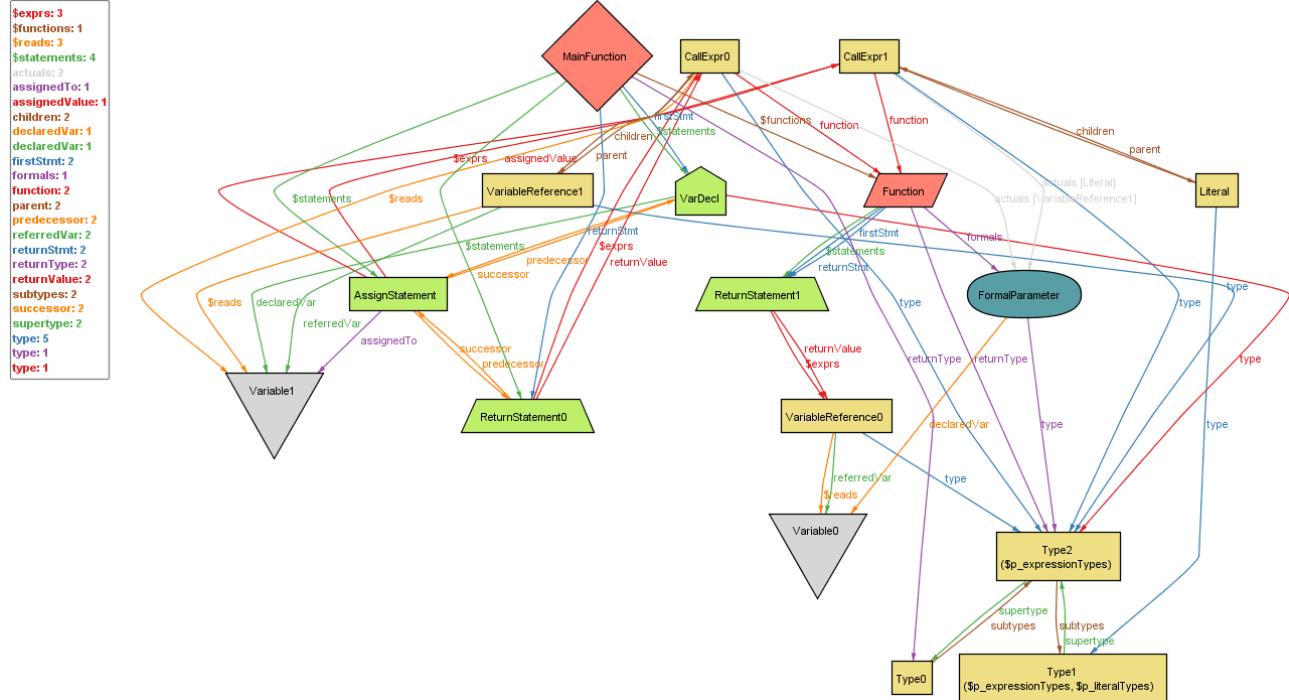
Instance 1



Instance 2



Instance 3

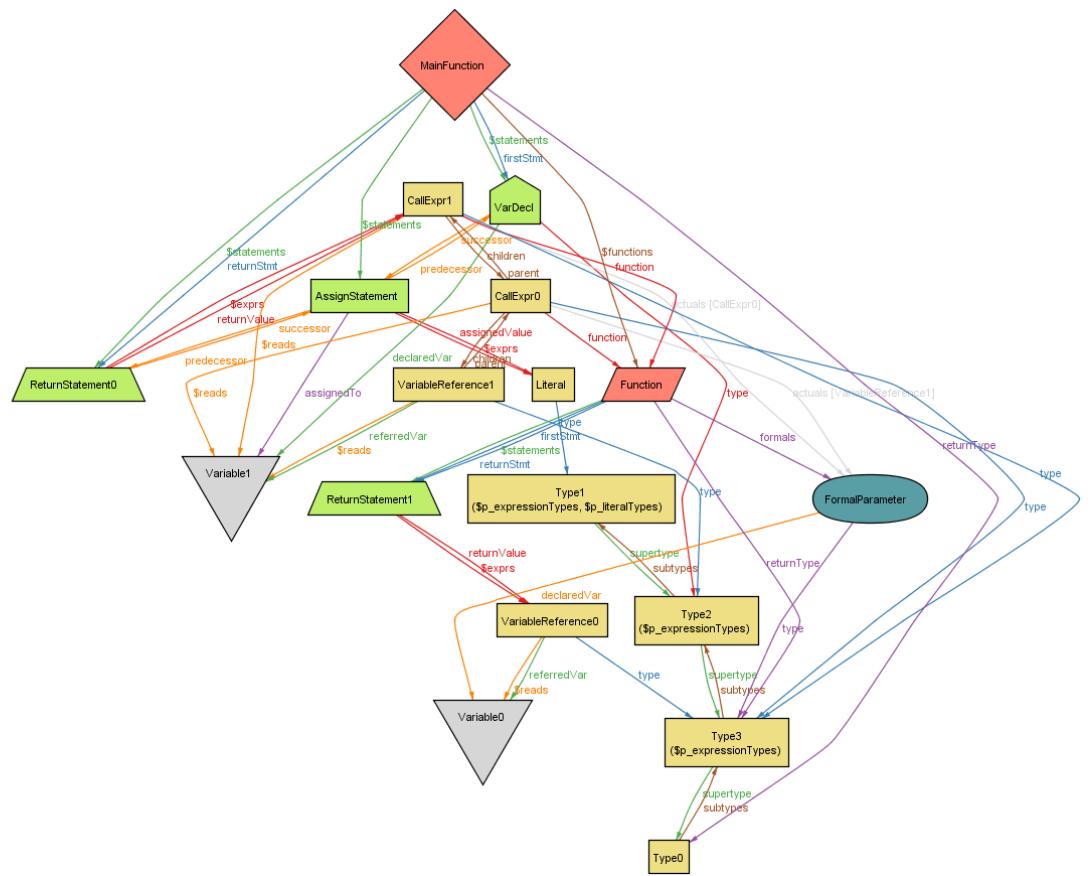


Instance 4

```

$exprs: 3
$functions: 1
$reads: 4
$statements: 4
actuals: 2
assignedTo: 1
assignedValue: 1
children: 2
declaredVar: 1
declaredVar: 1
firstStmt: 2
formals: 1
function: 2
parent: 2
predecessor: 2
referedVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
subtypes: 3
successor: 2
superType: 3
type: 5
type: 1
type: 1

```

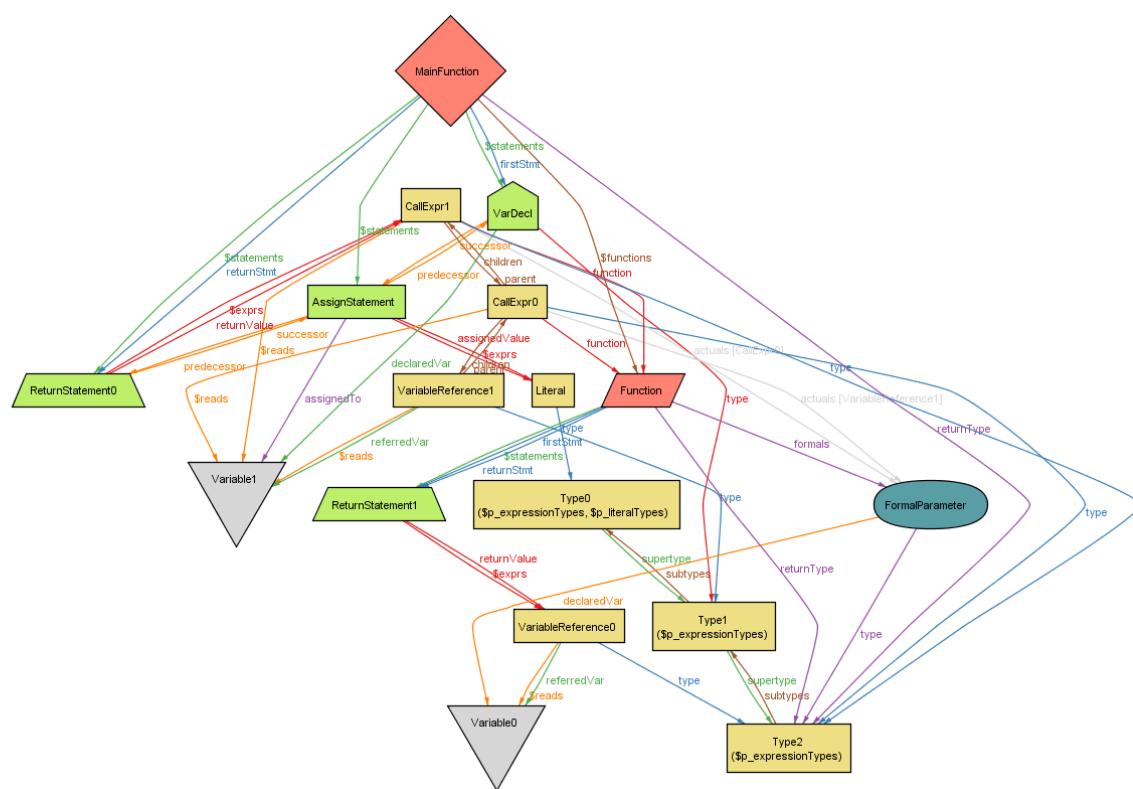


Instance 5

```

$exprs: 3
$functions: 1
$reads: 4
$statements: 4
actuals: 2
assignedTo: 1
assignedValue: 1
children: 2
declaredVar: 1
declaredVar: 1
firstStmt: 2
formals: 1
function: 2
parent: 2
predecessor: 2
referedVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
subtypes: 2
successor: 2
superType: 2
type: 5
type: 1
type: 1

```

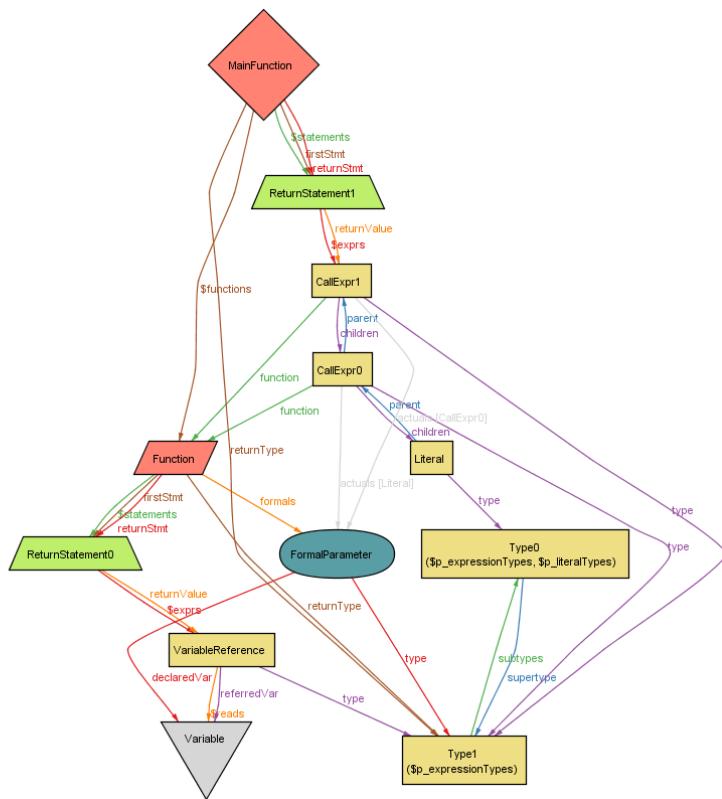


Instance 6

```

$exprs: 2
$functions: 1
$reads: 1
$statements: 2
actuals: 2
children: 2
declaredVar: 1
firstStmt: 2
formals: 1
function: 2
parent: 2
referedVar: 1
returnStmt: 2
returnType: 2
returnValue: 2
subtypes: 1
superType: 1
type: 4
type: 1

```

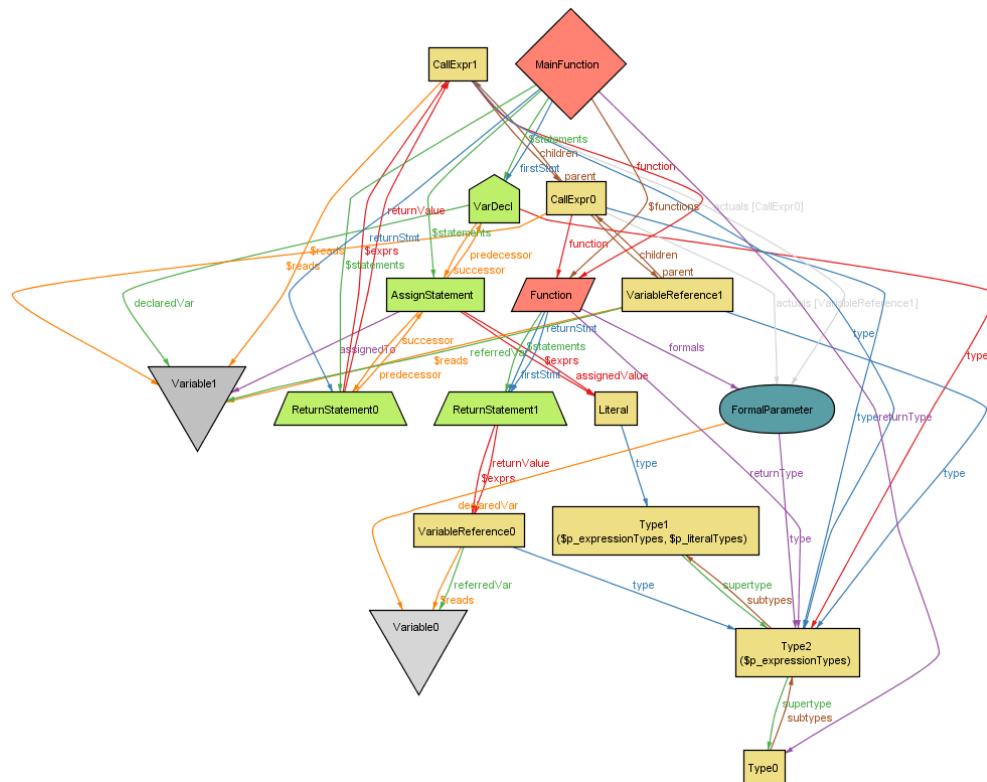


Instance 7

```

$exprs: 3
$functions: 1
$reads: 4
$statements: 4
actuals: 2
assignedTo: 1
assignedValue: 1
children: 2
declaredVar: 1
declaredVar: 1
firstStmt: 2
formals: 1
function: 2
parent: 2
predecessor: 2
referedVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
subtypes: 2
successor: 2
superType: 2
type: 5
type: 1
type: 1

```

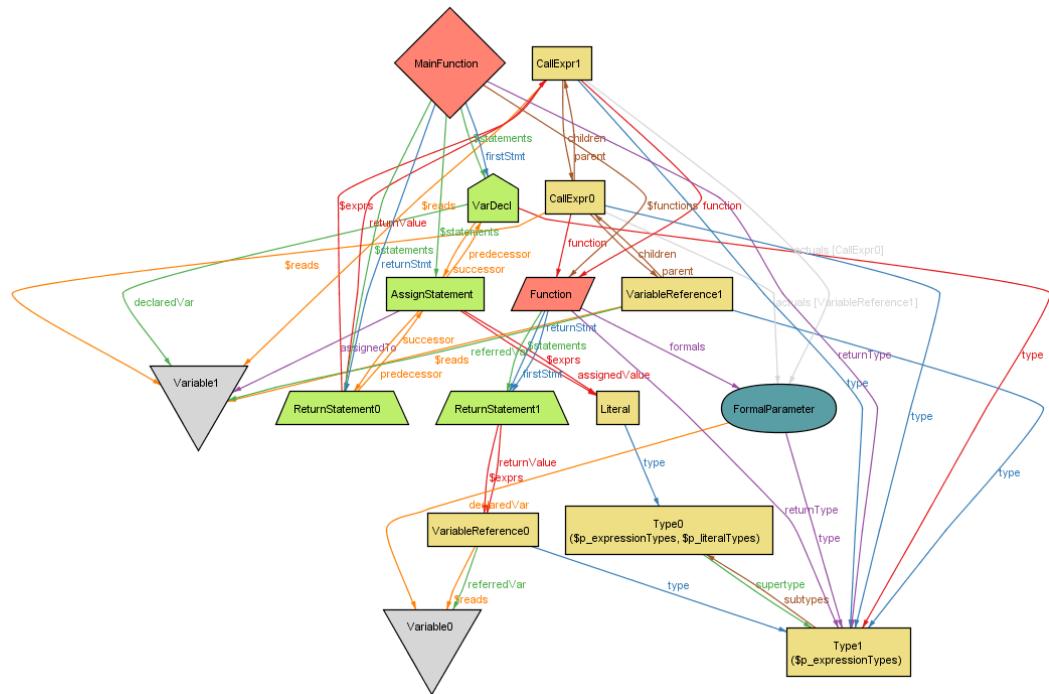


Instance 8

```

$exprs: 3
$functions: 1
$reads: 4
$statements: 4
actuals: 2
assignedTo: 1
assignedValue: 1
children: 2
declaredVar: 1
declaredVar: 1
firstStmt: 2
formals: 1
function: 2
parent: 2
predecessor: 2
referredVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
subtypes: 1
successor: 2
superType: 1
type: 5
type: 1
type: 1

```

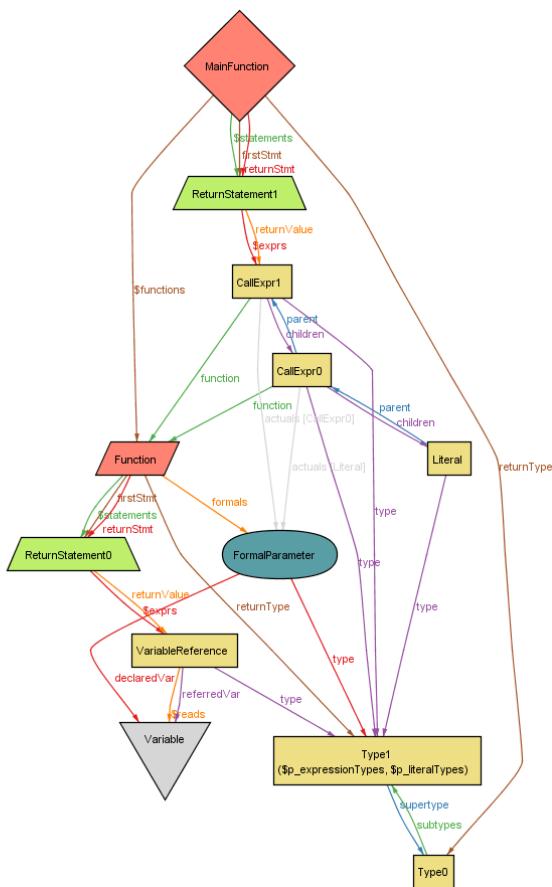


Instance 9

```

$exprs: 2
$functions: 1
$reads: 1
$statements: 2
actuals: 2
children: 2
declaredVar: 1
firstStmt: 2
formals: 1
function: 2
parent: 2
predecessor: 1
referredVar: 1
returnStmt: 2
returnType: 2
returnValue: 2
subtypes: 1
superType: 1
type: 4
type: 1

```

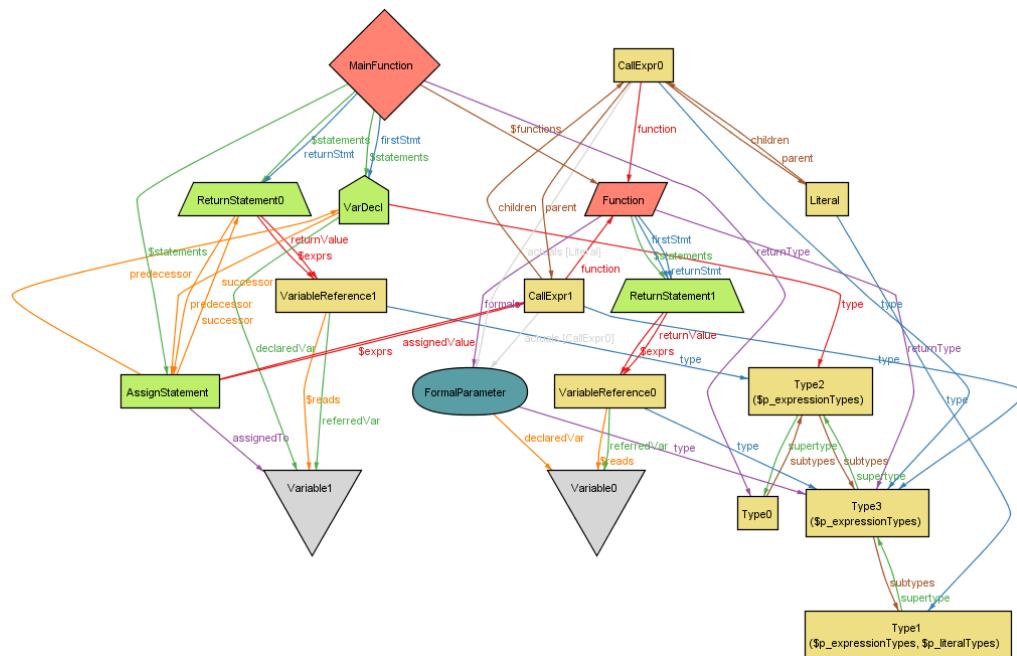


Instance 10

```

$exprs: 3
$functions: 1
$reads: 2
$statements: 4
actuals: 2
assignedTo: 1
assignedValue: 1
children: 2
declaredVar: 1
declaredVar: 1
firstStmt: 2
formals: 1
function: 2
parent: 2
predecessor: 2
referredVar: 2
returnStmt: 2
returnValue: 2
subtypes: 3
successor: 2
superType: 3
type: 5
type: 1
type: 1

```

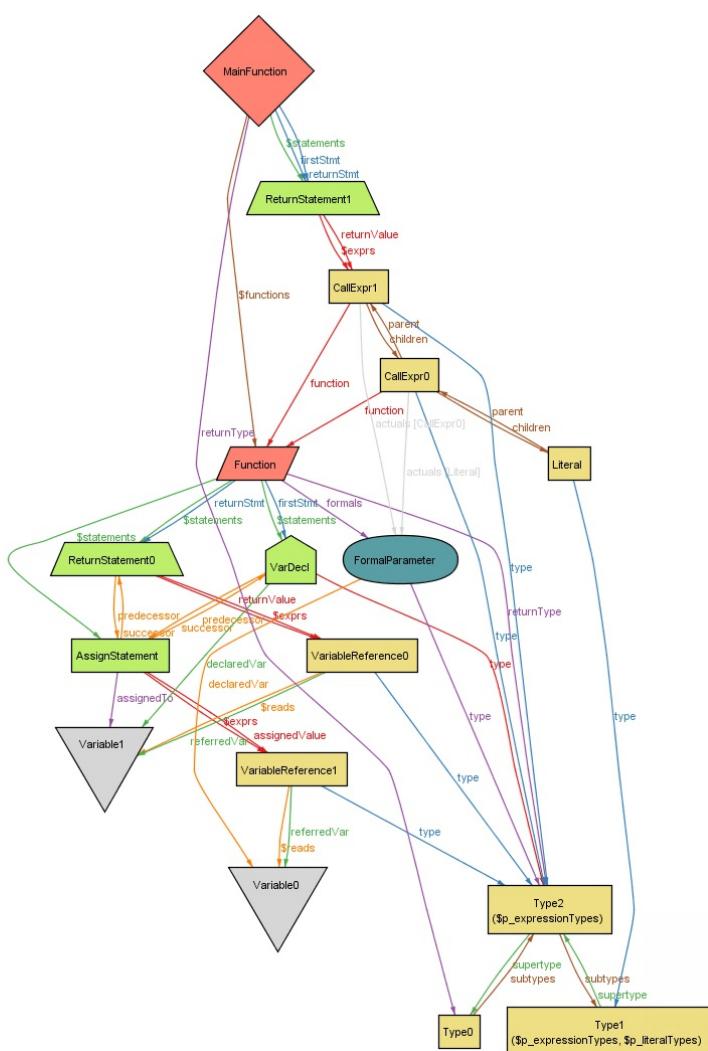


Instance 11

```

$exprs: 3
$functions: 1
$reads: 2
$statements: 4
actuals: 2
assignedTo: 1
assignedValue: 1
children: 2
declaredVar: 1
declaredVar: 1
firstStmt: 2
formals: 1
function: 2
parent: 2
predecessor: 2
referredVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
subtypes: 2
successor: 2
superType: 2
type: 5
type: 1
type: 1

```

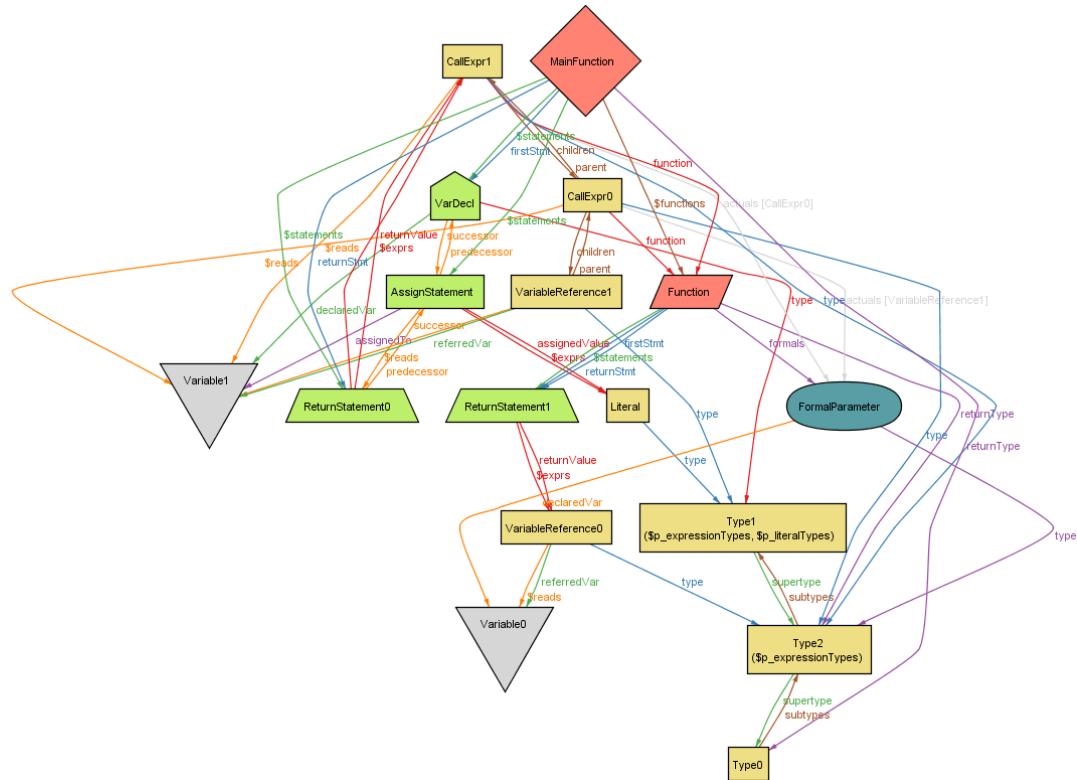


Instance 12

```

$exprs: 3
$functions: 1
$reads: 4
$statements: 4
actuals: 2
assignedTo: 1
assignedValue: 1
children: 2
declaredVar: 1
declaredVar: 1
firstStmt: 2
formals: 1
function: 2
parent: 2
predecessor: 2
referedVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
subtypes: 2
successor: 2
superType: 2
type: 5
type: 1
type: 1

```

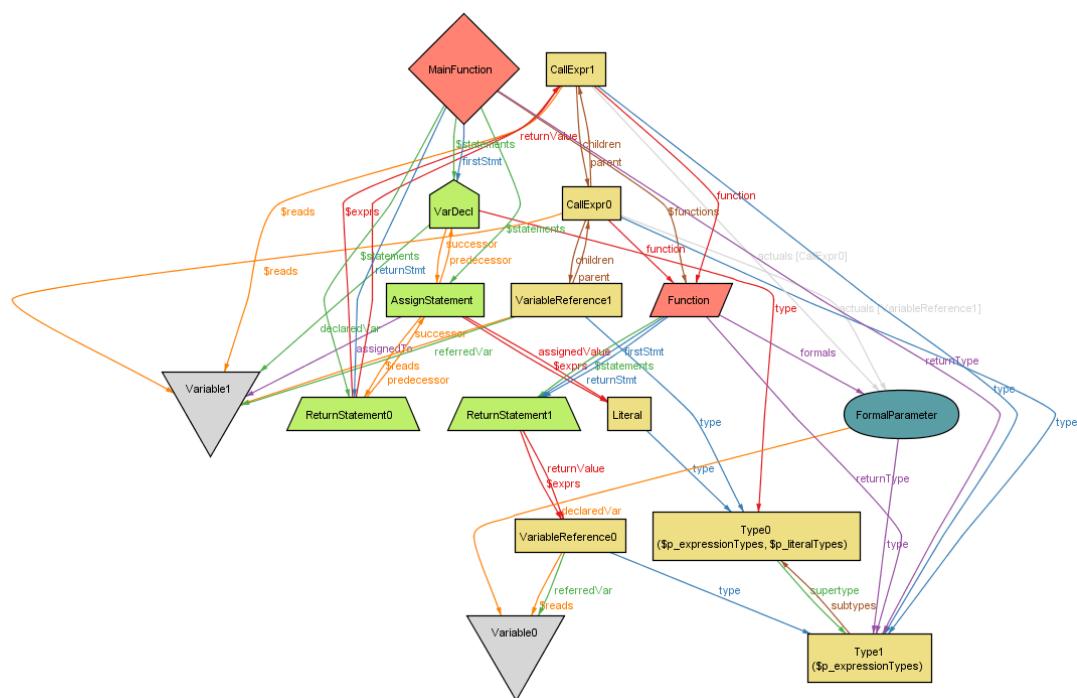


Instance 13

```

$exprs: 3
$functions: 1
$reads: 4
$statements: 4
actuals: 2
assignedTo: 1
assignedValue: 1
children: 2
declaredVar: 1
declaredVar: 1
firstStmt: 2
formals: 1
function: 2
parent: 2
predecessor: 2
referedVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
subtypes: 1
successor: 2
superType: 1
type: 5
type: 1
type: 1

```

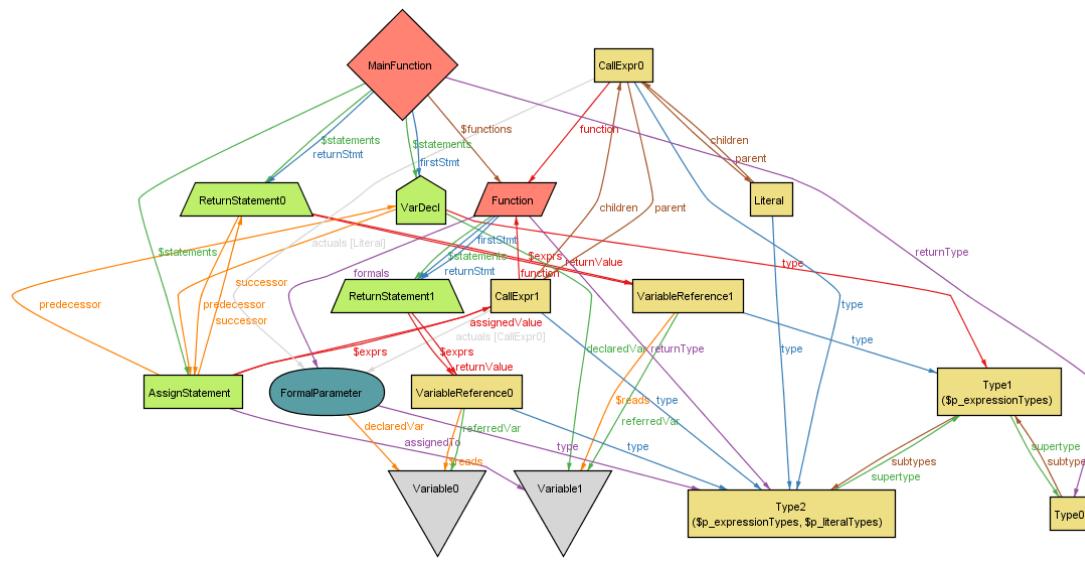


Instance 14

```

$exprs: 3
$functions: 1
$reads: 2
$statements: 4
actuals: 2
assignedTo: 1
assignedValue: 1
children: 2
declaredVar: 1
declaredVar: 1
firstStmt: 2
formals: 1
function: 2
parent: 2
predecessor: 2
referedVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
subtypes: 2
successor: 2
supertype: 2
type: 5
type: 1
type: 1

```

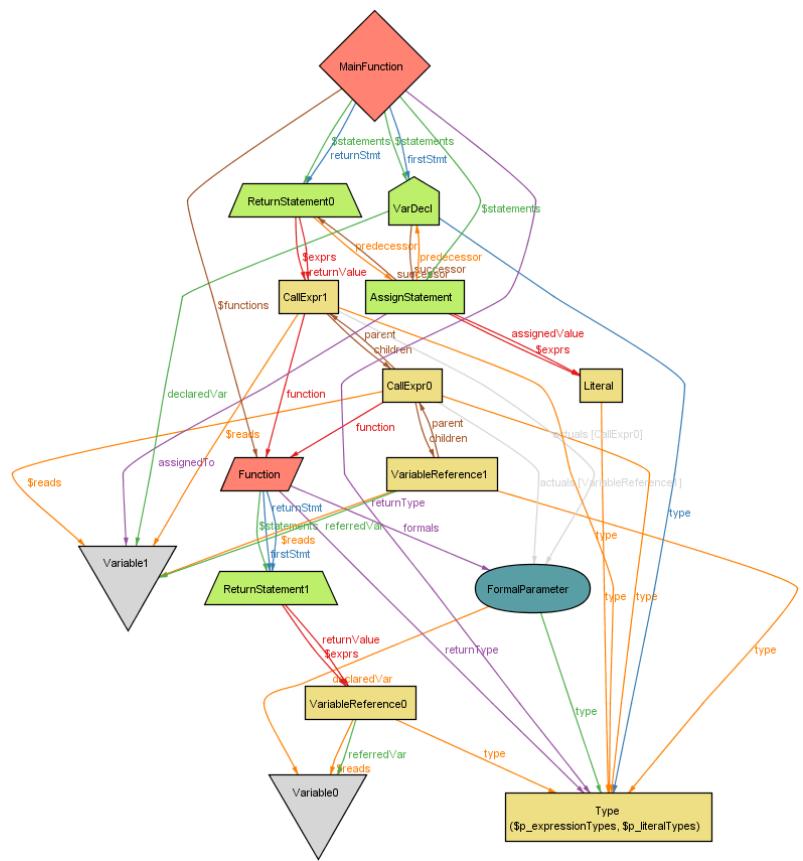


Instance 15

```

$exprs: 3
$functions: 1
$reads: 4
$statements: 4
actuals: 2
assignedTo: 1
assignedValue: 1
children: 2
declaredVar: 1
declaredVar: 1
firstStmt: 2
formals: 1
function: 2
parent: 2
predecessor: 2
referedVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
subtypes: 2
successor: 2
type: 5
type: 1
type: 1

```

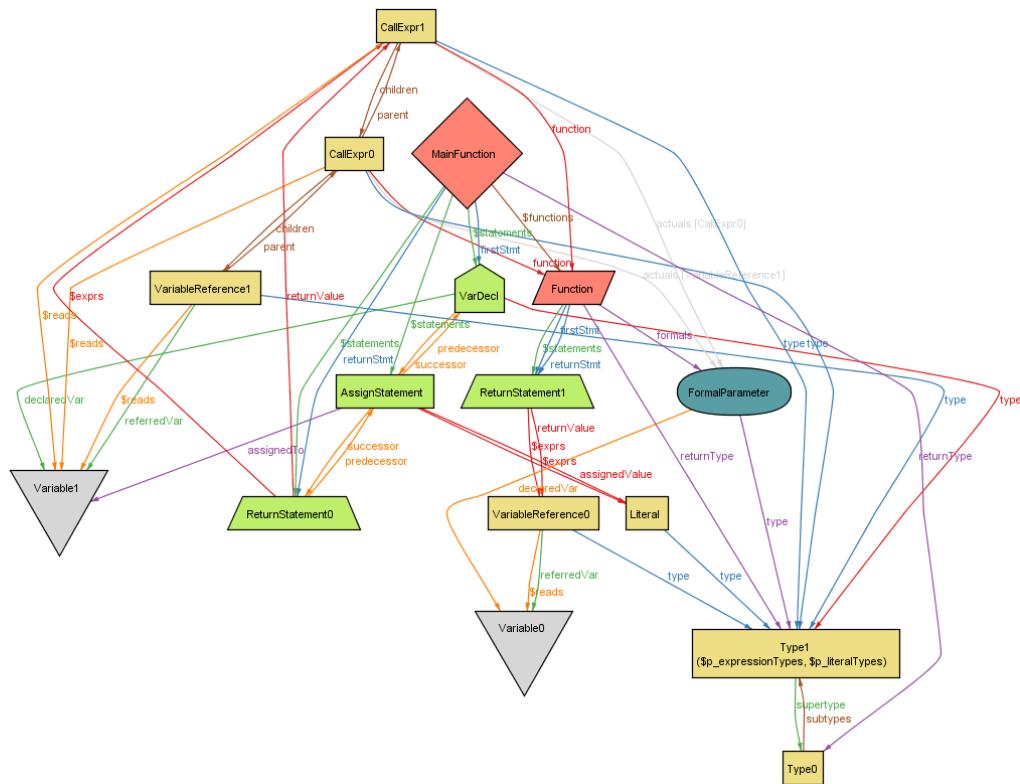


Instance 16

```

$exprs: 3
$functions: 1
$reads: 4
$statements: 4
actuals: 2
assignedTo: 1
assignedValue: 1
children: 2
declaredVar: 1
declaredVar: 1
firstStmt: 2
formals: 1
function: 2
parent: 2
predecessor: 2
referredVar: 2
returnStmt: 2
returnValue: 2
subtypes: 1
successor: 2
superType: 1
type: 5
type: 1
type: 1

```

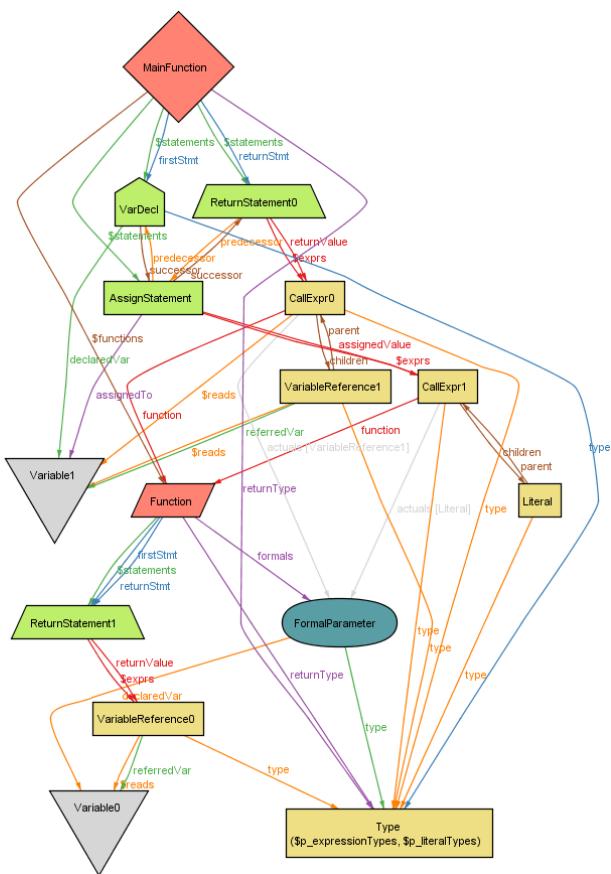


Instance 17

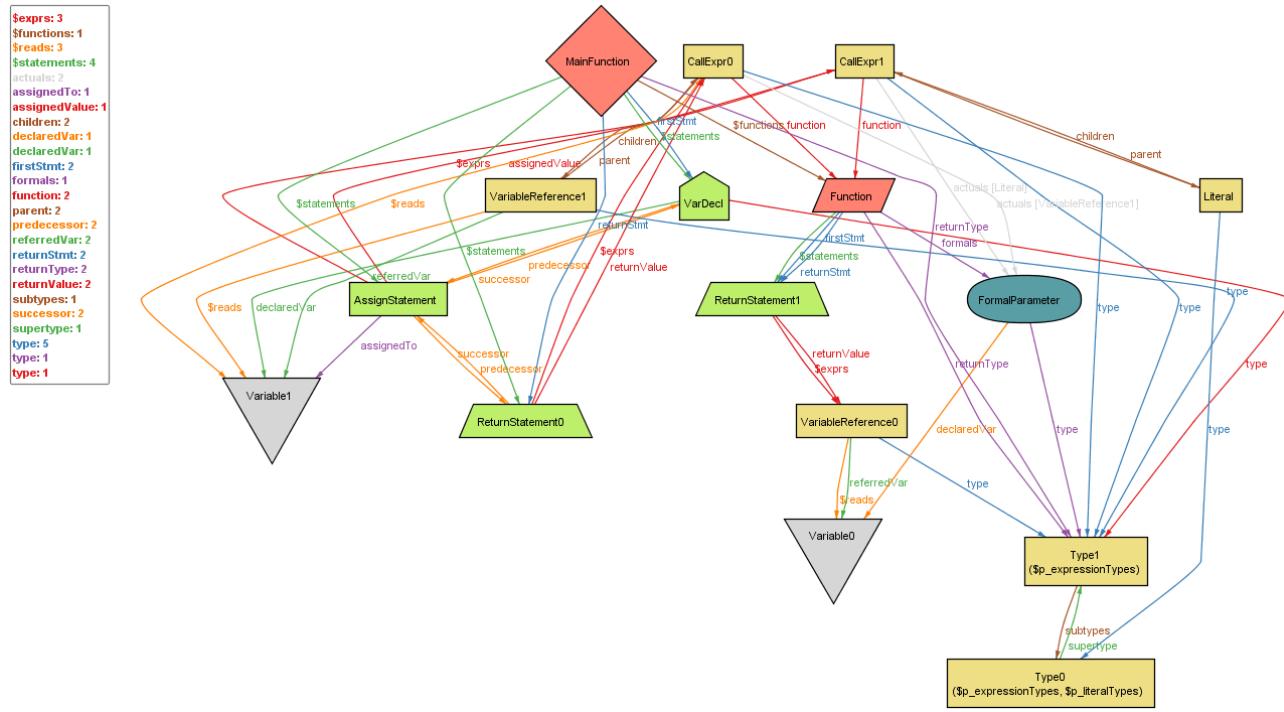
```

$exprs: 3
$functions: 1
$reads: 3
$statements: 4
actuals: 1
assignedTo: 1
assignedValue: 1
children: 2
declaredVar: 1
declaredVar: 1
firstStmt: 2
formals: 1
function: 2
parent: 2
predecessor: 2
referredVar: 2
returnStmt: 2
returnValue: 2
subtypes: 2
successor: 2
superType: 1
type: 5
type: 1
type: 1

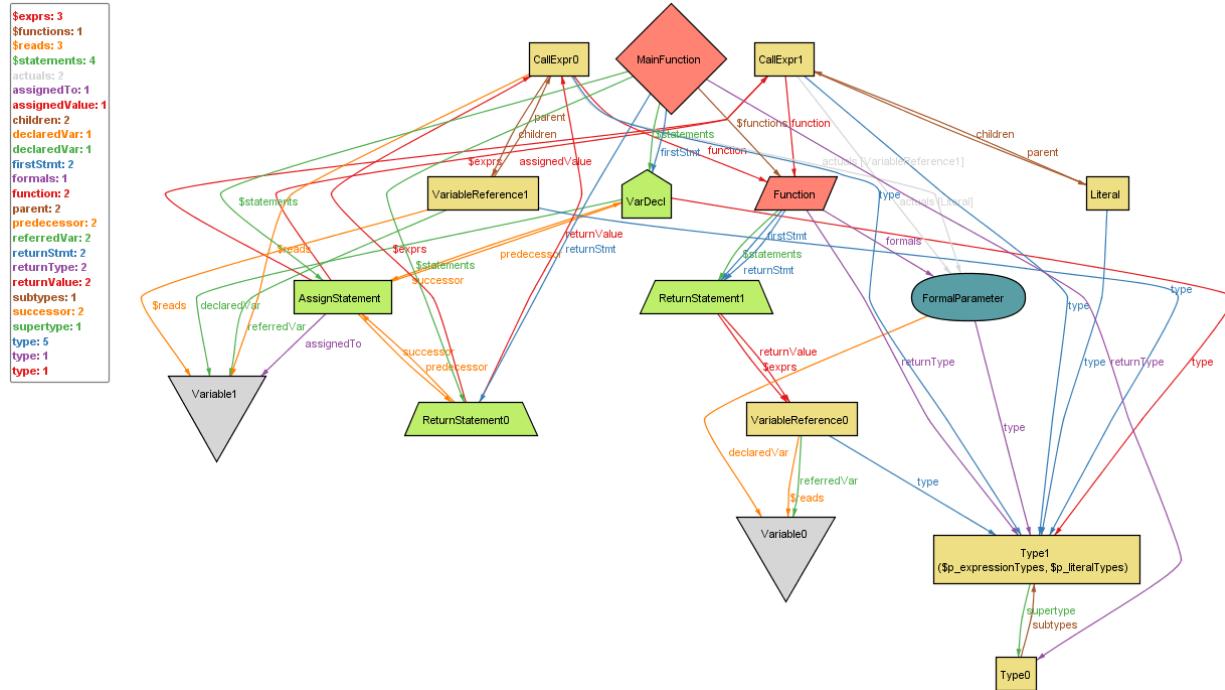
```



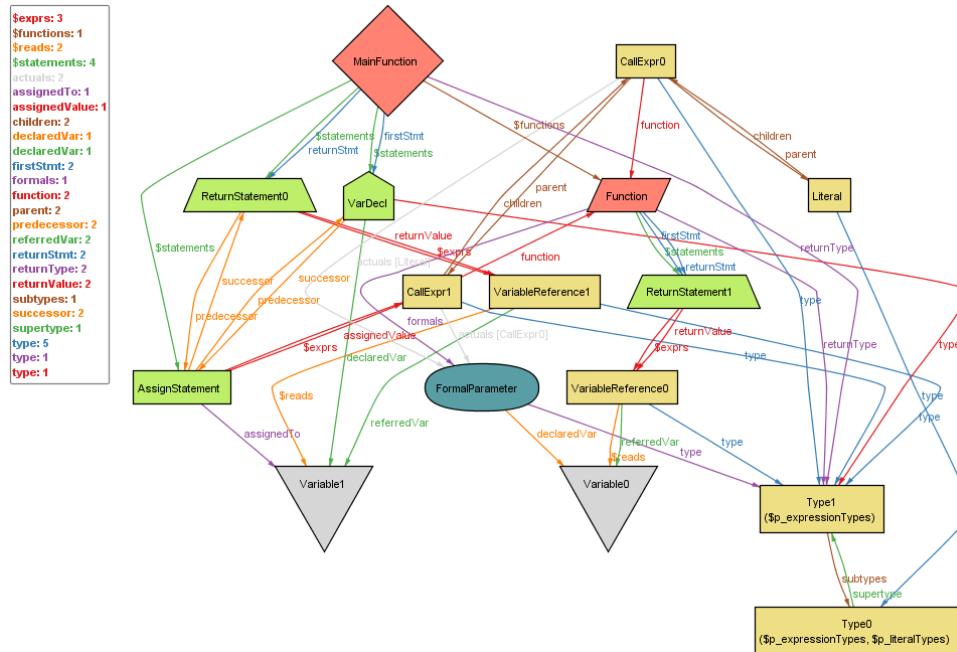
Instance 18



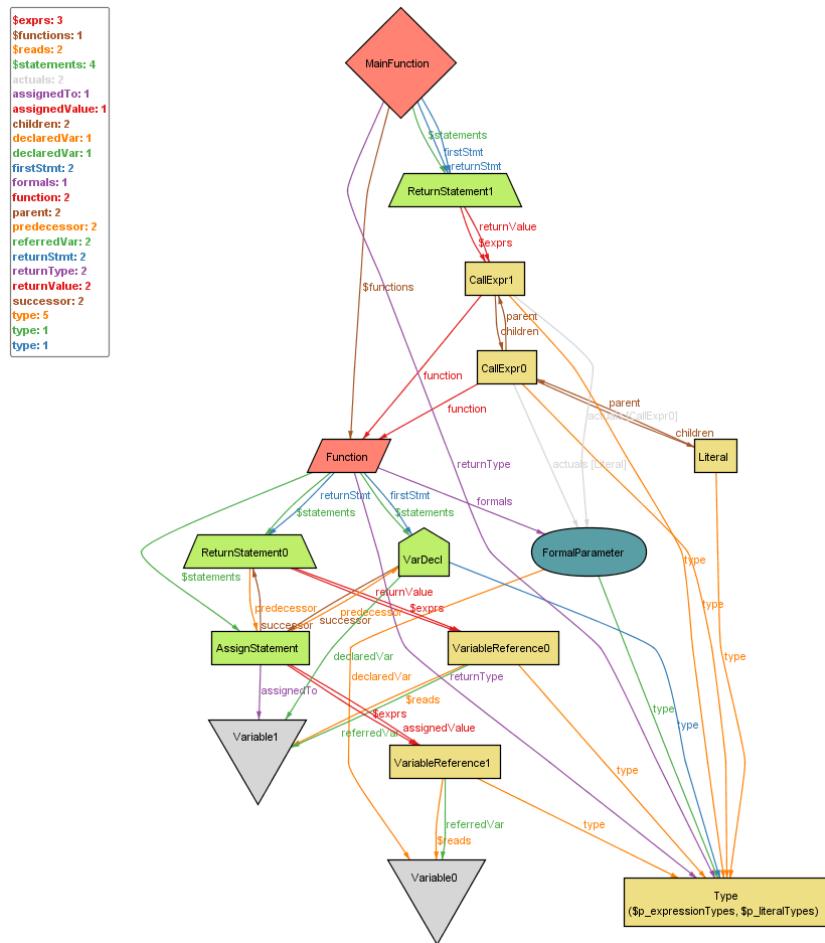
Instance 19



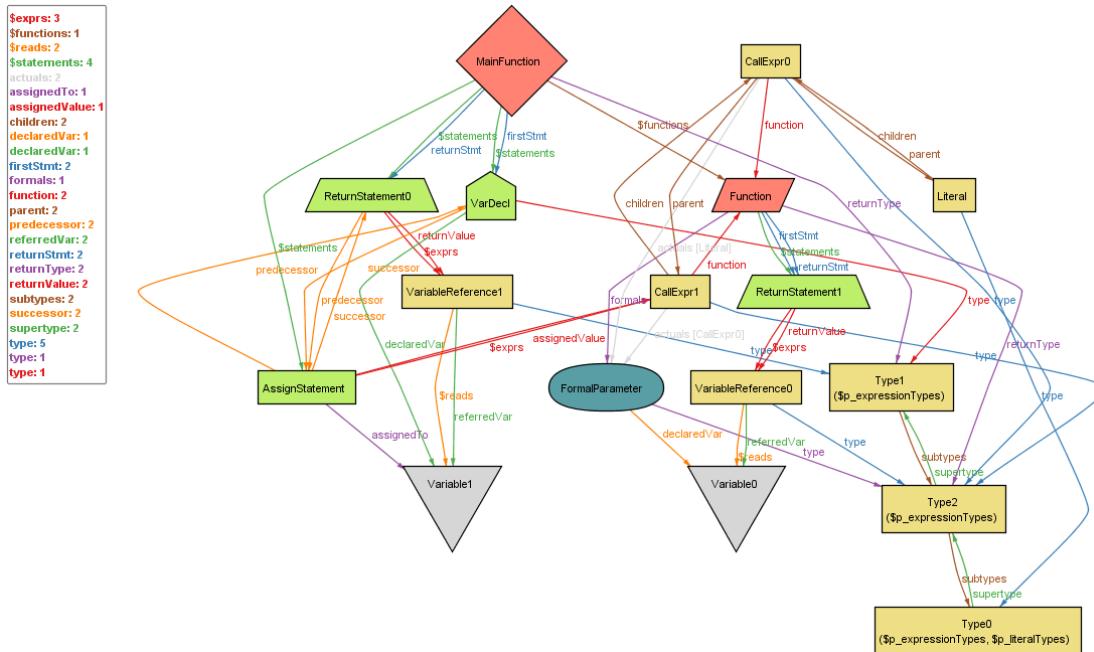
Instance 20



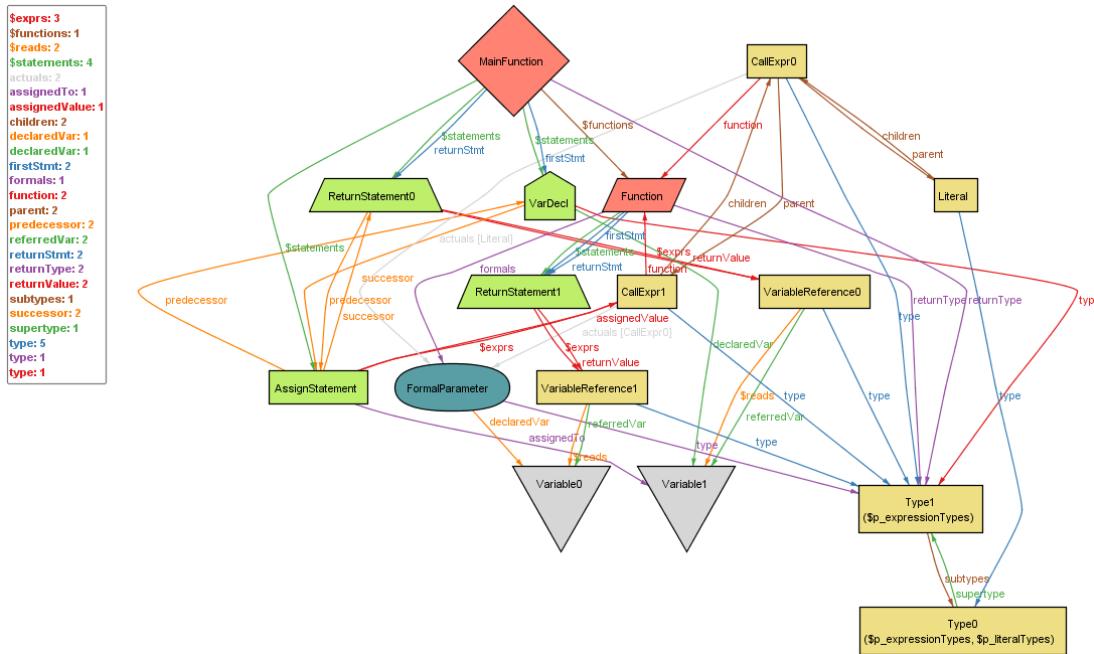
Instance 21



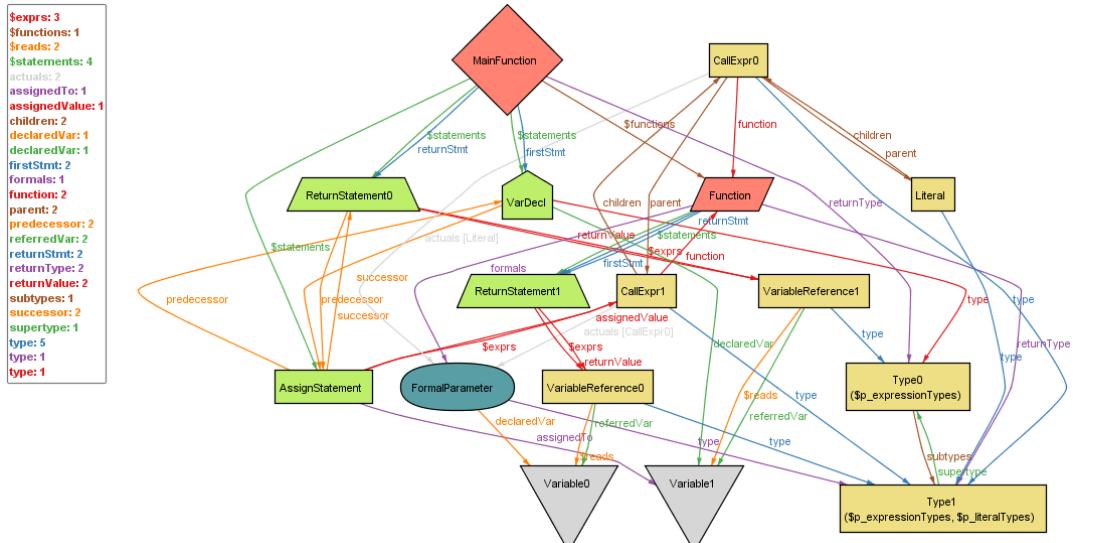
Instance 22



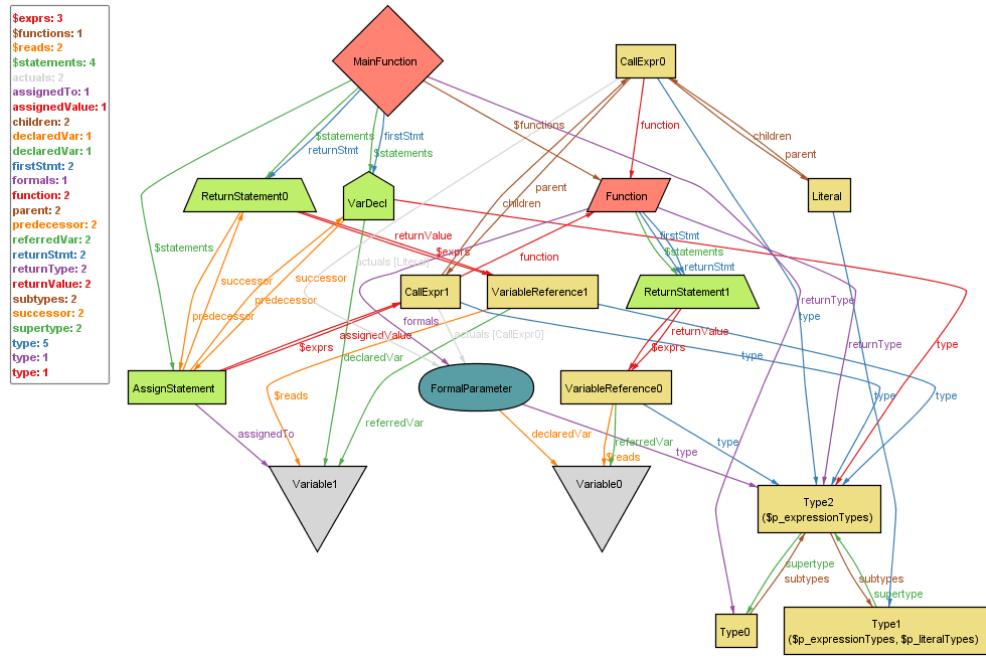
Instance 23



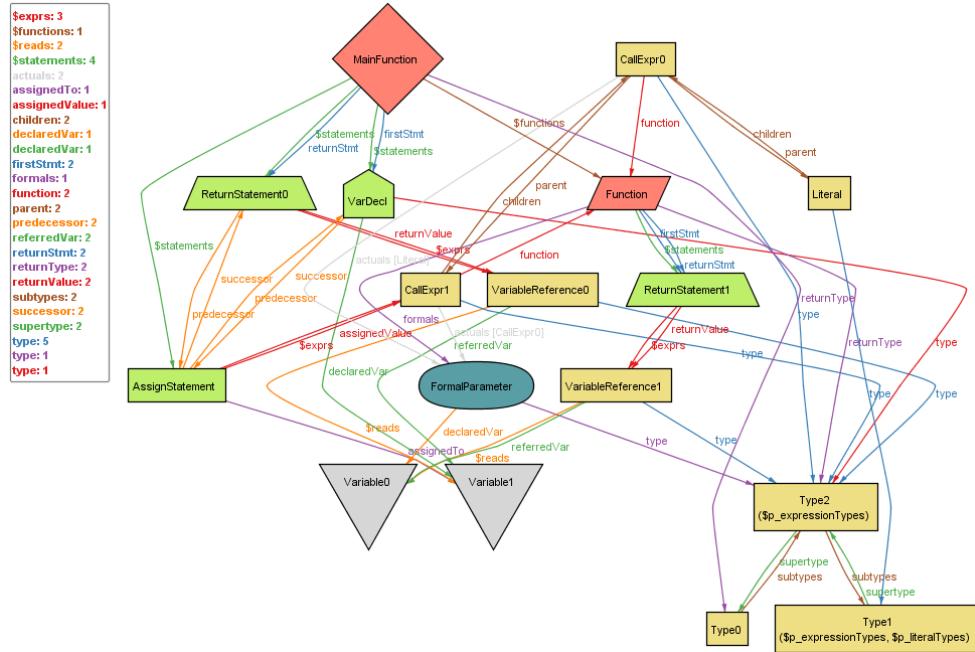
Instance 24



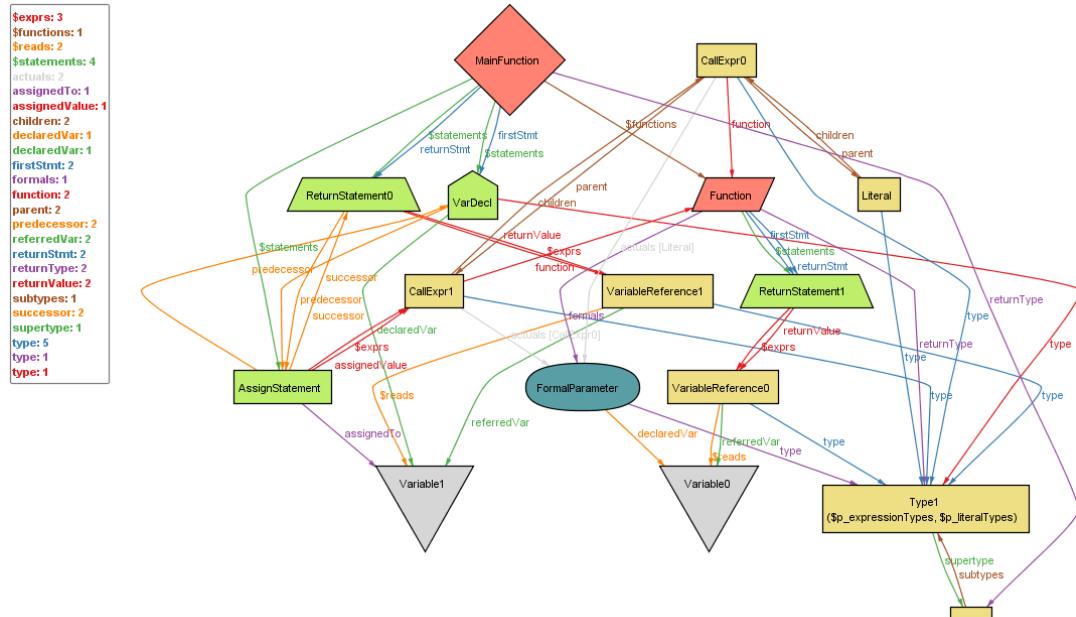
Instance 25



Instance 26

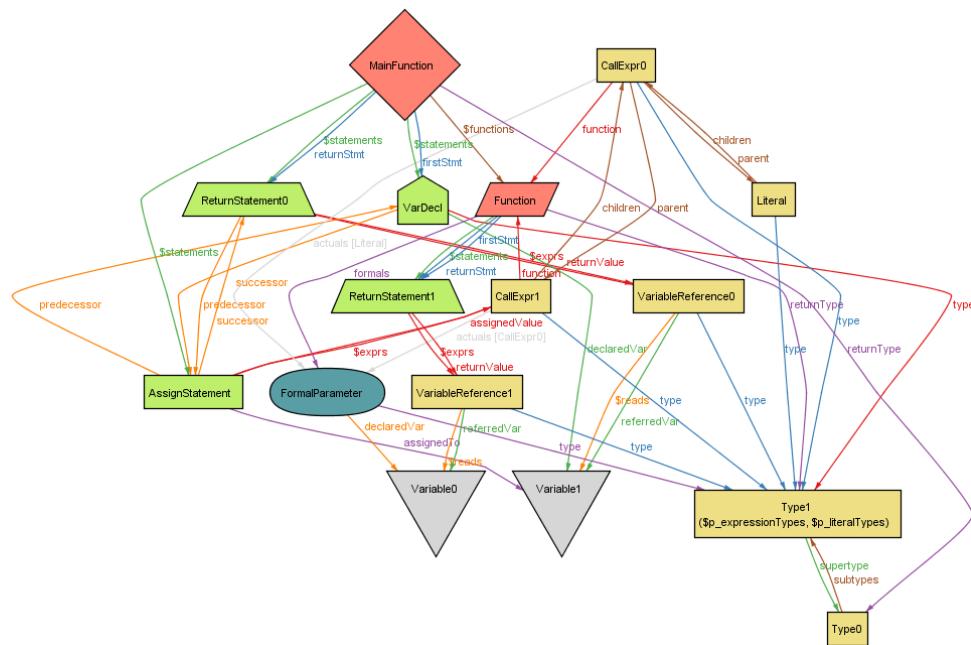


Instance 27



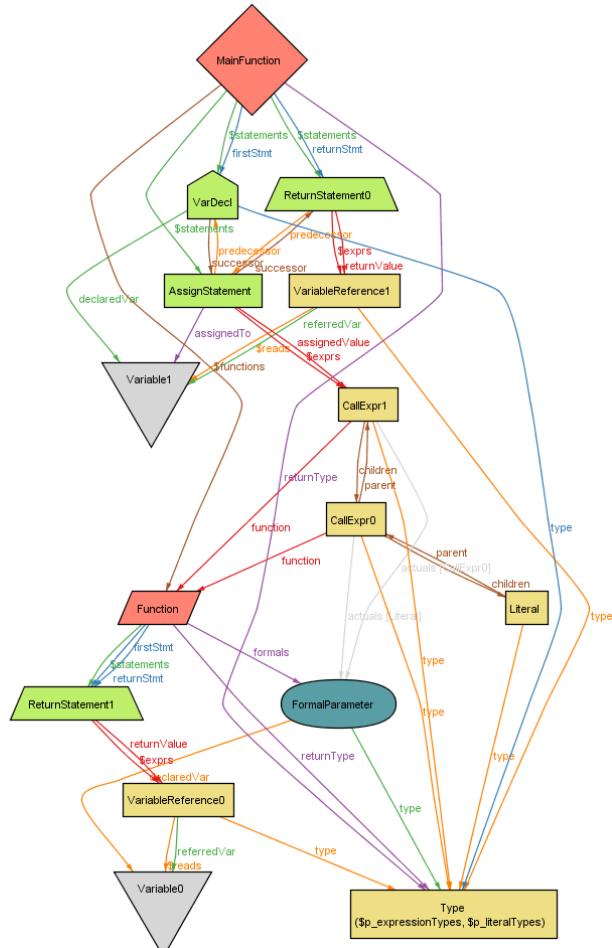
Instance 28

```
$exprs: 3
$functions: 1
$reads: 2
$statements: 4
actuals: 2
assignedTo: 1
assignedValue: 1
children: 2
declaredVar: 1
declaredVar: 1
firstStmt: 2
formals: 1
function: 2
parent: 2
predecessor: 2
referredVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
subtypes: 1
successor: 2
superType: 1
type: 5
type: 1
type: 1
```



Instance 29

```
$exprs: 3
$functions: 1
$reads: 2
$statements: 4
actuals: 2
assignedTo: 1
assignedValue: 1
children: 2
declaredVar: 1
declaredVar: 1
firstStmt: 2
formals: 1
function: 2
parent: 2
predecessor: 2
referredVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
successor: 2
superType: 1
type: 5
type: 1
type: 1
```

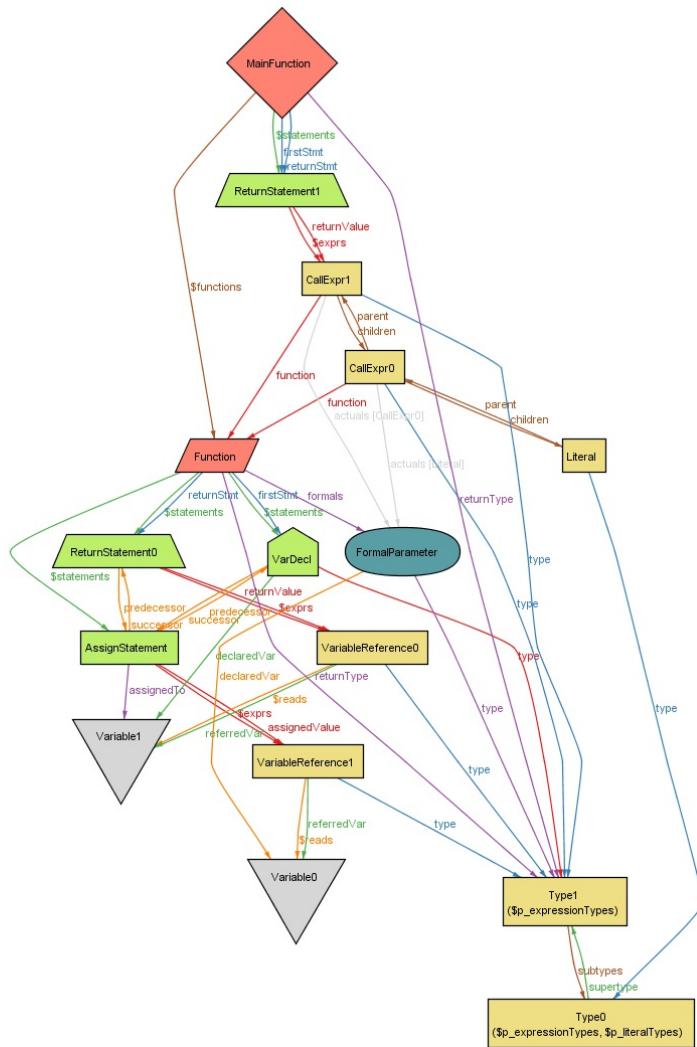


Instance 30

```

$exprs: 3
$functions: 1
$statements: 2
$types: 4
actuals: 2
assignedTo: 1
assignedValue: 1
children: 2
declaredVar: 1
firstStmt: 2
formals: 1
function: 2
parent: 2
predecessor: 2
referredVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
successor: 2
subtypes: 1
superType: 1
type: 5
type1: 1
type: 1
type: 1

```

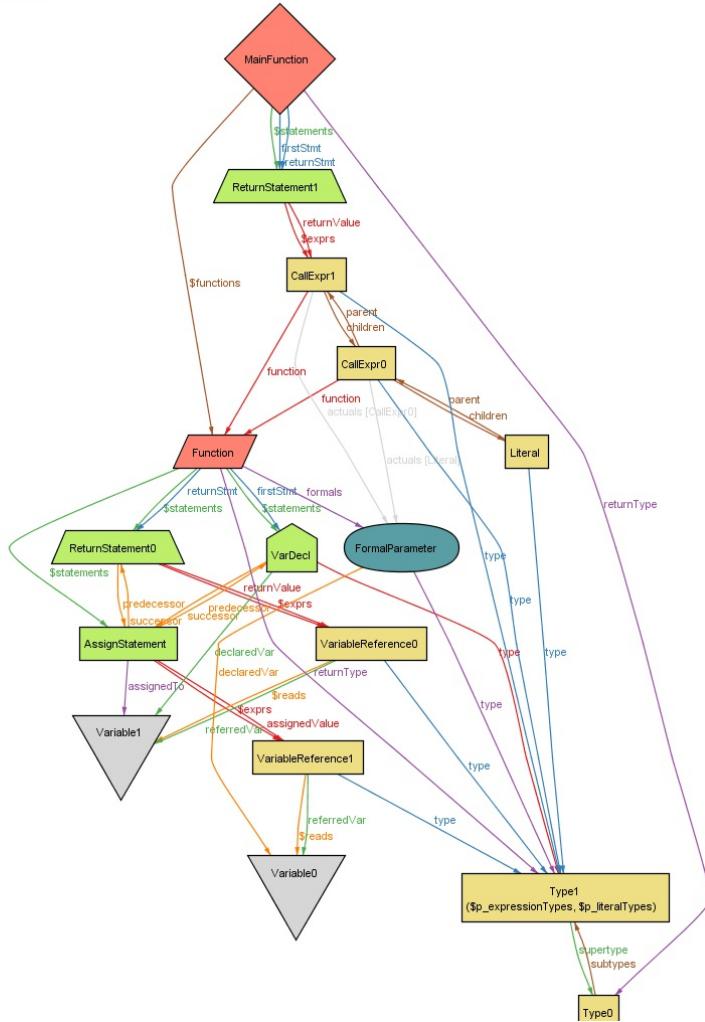


Instance 31

```

$exprs: 3
$functions: 1
$reads: 2
$statements: 4
actuals: 2
assignedTo: 1
assignedValue: 1
children: 2
declaredVar: 1
declarer: 1
firstStmt: 2
formals: 1
function: 2
parent: 2
predecessor: 2
referredVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
successor: 2
superType: 1
type: 5
type: 1
type: 1

```



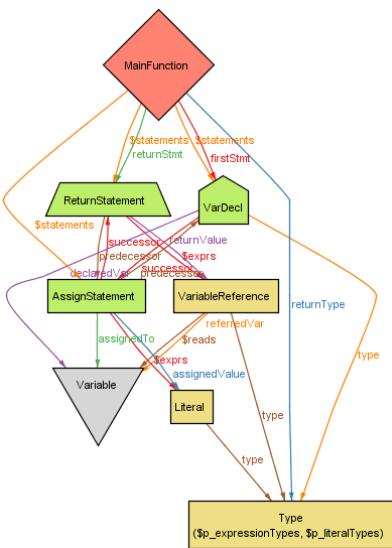
Instance 3

Instance 1

```

$exprs: 2
$reads: 1
$statements: 3
assignedTo: 1
assignedValue: 1
declaredVar: 1
firstStmt: 1
predecessor: 2
referredVar: 1
returnStmt: 1
returnType: 1
returnValue: 1
successor: 2
type: 2
type: 1

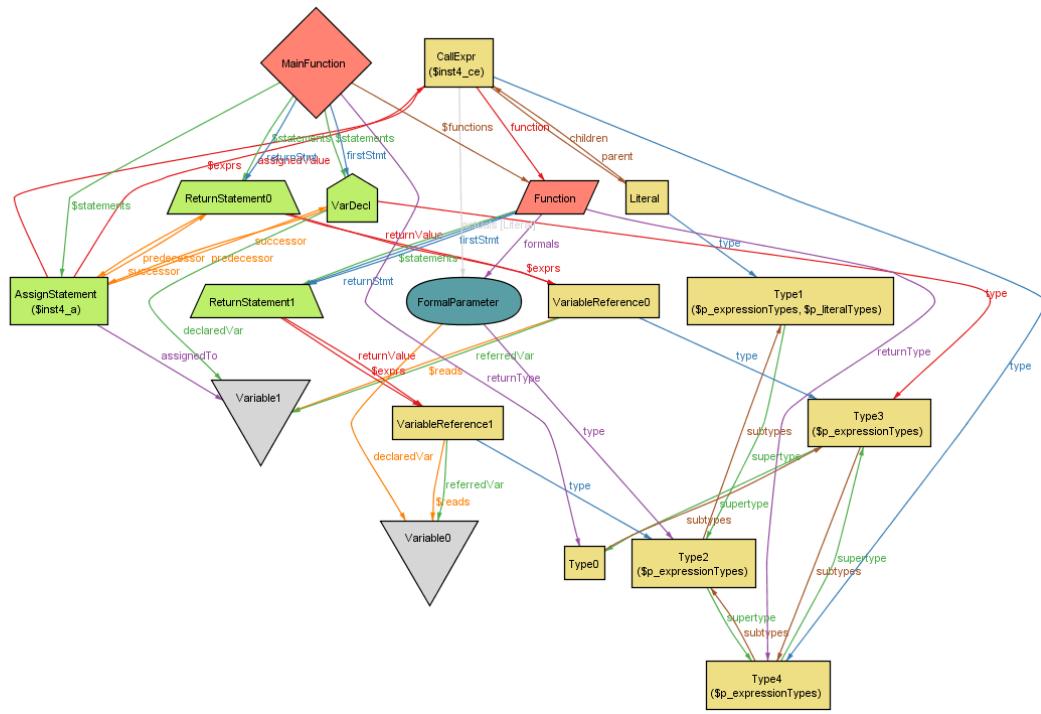
```



Instance 4

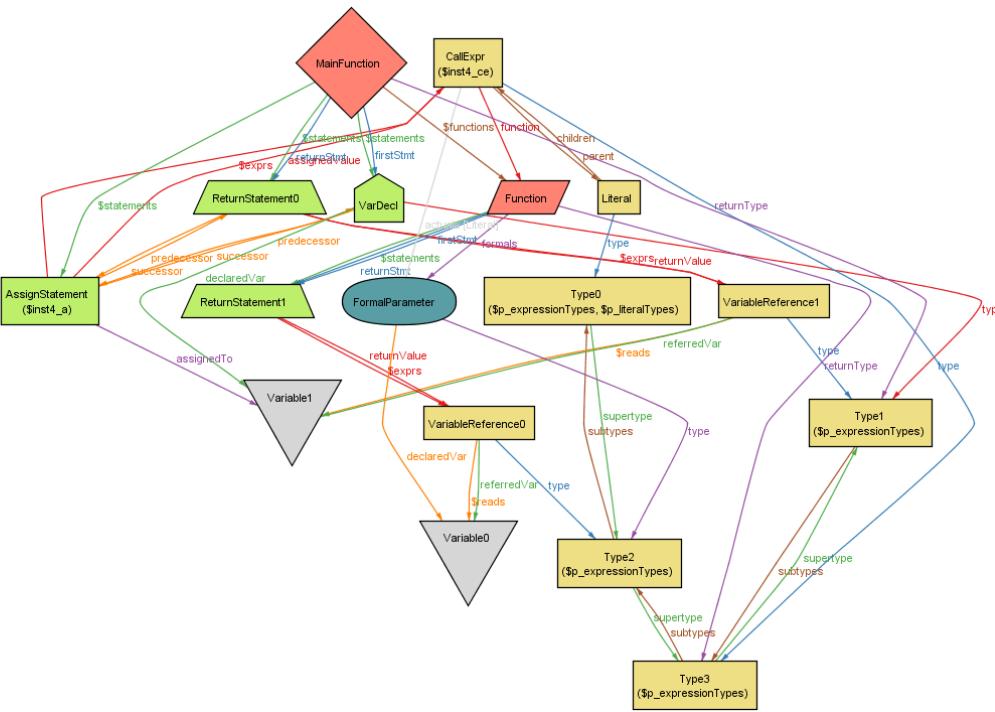
Instance 1

```
$exprs: 3  
$functions: 1  
$reads: 2  
$statements: 4  
$actuals: 1  
assignedTo: 1  
assignedValue: 1  
children: 1  
declaredVar: 1  
declaredVar: 1  
firstStmt: 2  
forms: 1  
function: 1  
parent: 1  
predecessor: 2  
referedVar: 2  
return Stmt: 2  
returnType: 2  
returnValue: 2  
subtypes: 4  
successor: 2  
super type: 4  
type: 4  
type: 1  
type: 1
```



Instance 2

```
$exprs: 3  
$functions: 1  
$reads: 2  
$statements: 4  
actuals: 1  
assignedTo: 1  
assignedValue: 1  
children: 1  
declaredVar: 1  
declaredVar: 1  
firstStmt: 2  
forms: 1  
function: 1  
parent: 1  
predecessor: 2  
REFERREDVAR: 2  
returnStmt: 2  
returnType: 2  
returnValue: 2  
subtypes: 3  
successor: 2  
superType: 3  
type: 4  
type: 1  
type: 1
```

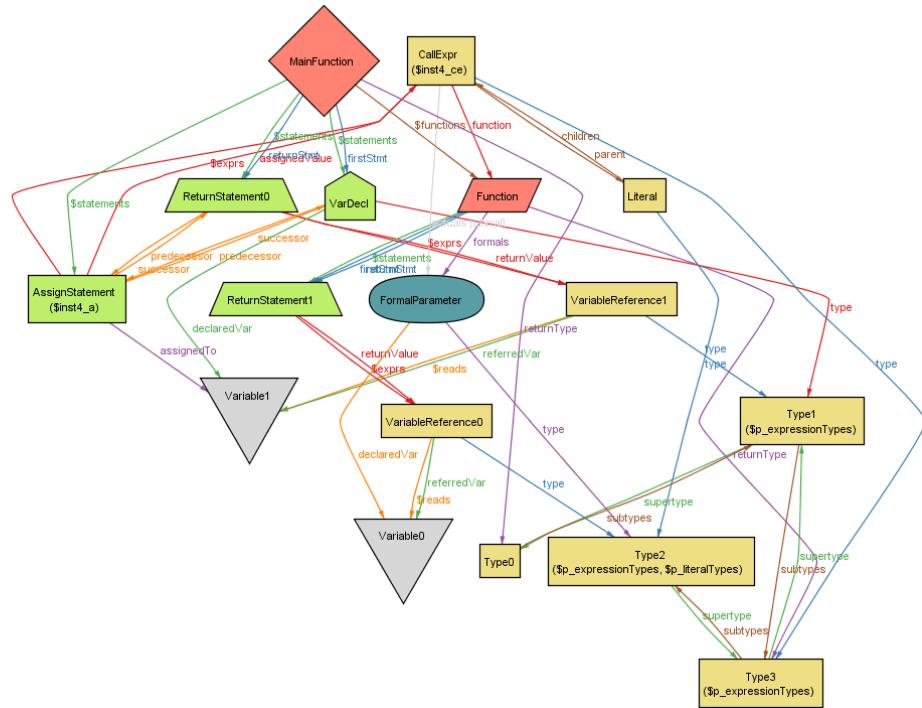


Instance 3

```

$exprs: 3
$reads: 1
$statements: 2
$functions: 4
actuals: 1
assignedTo: 1
assignedValue: 1
children: 1
declaredVar: 1
declaredVar: 1
firstStmt: 2
formals: 1
function: 1
parent: 1
predecessor: 2
referedVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
subtypes: 3
successor: 2
superType: 3
type: 4
type: 1
type: 1

```

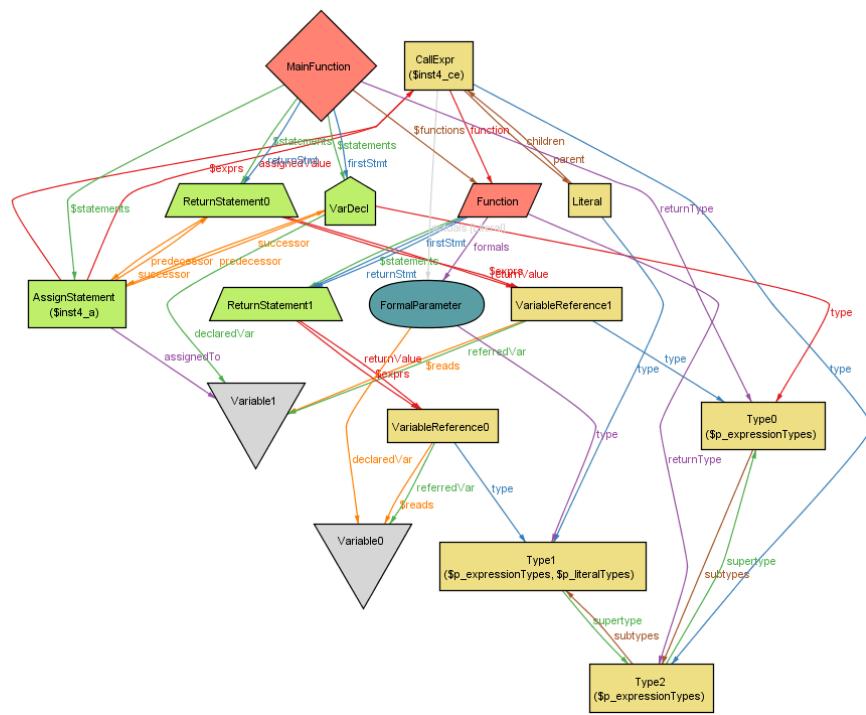


Instance 4

```

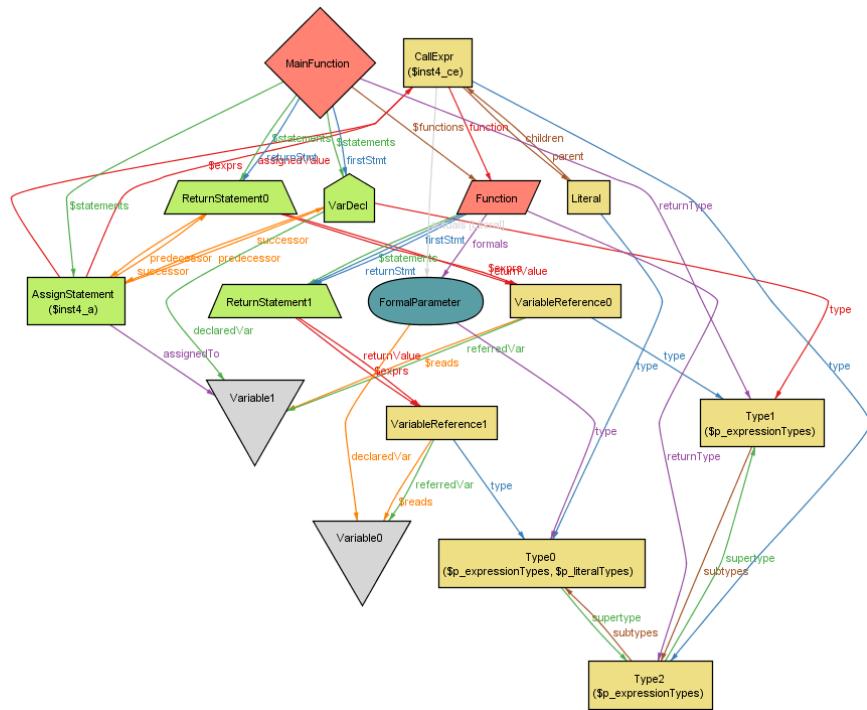
$exprs: 3
$reads: 1
$statements: 2
$functions: 4
actuals: 1
assignedTo: 1
assignedValue: 1
children: 1
declaredVar: 1
declaredVar: 1
firstStmt: 2
formals: 1
function: 1
parent: 1
predecessor: 2
referedVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
subtypes: 2
successor: 2
superType: 2
type: 4
type: 1
type: 1

```



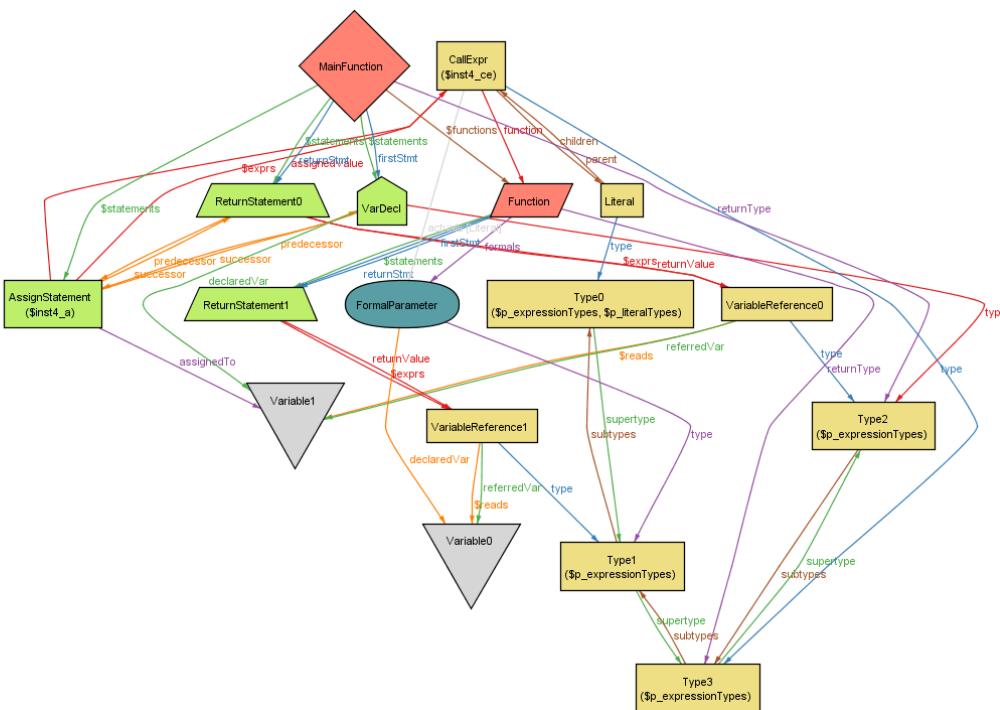
Instance 5

```
$exprs: 3
$functions: 1
$reads: 2
$statements: 4
actuals: 1
assignedTo: 1
assignedValue: 1
children: 1
declaredVar: 1
declaredVar: 1
firstStmt: 2
forms: 1
function: 1
parent: 1
predecessor: 2
REFERREDVar: 2
return Stmt: 2
returnType: 2
returnValue: 2
subtypes: 2
successor: 2
super type: 2
type: 4
type: 1
type: 1
```



Instance 6

```
$exprs: 3  
$functions: 1  
$reads: 2  
$statements: 4  
actuals: 1  
assignedTo: 1  
assignedValue: 1  
children: 1  
declaredAV: 1  
declaredVar: 1  
firstStmt: 2  
formals: 1  
function: 1  
parent: 1  
predecessor: 2  
REFERREDVAR: 2  
return Stmt: 2  
returnType: 2  
returnValue: 2  
subtypes: 2  
successor: 2  
super type: 3  
type: 4  
type: 1  
type: 1
```

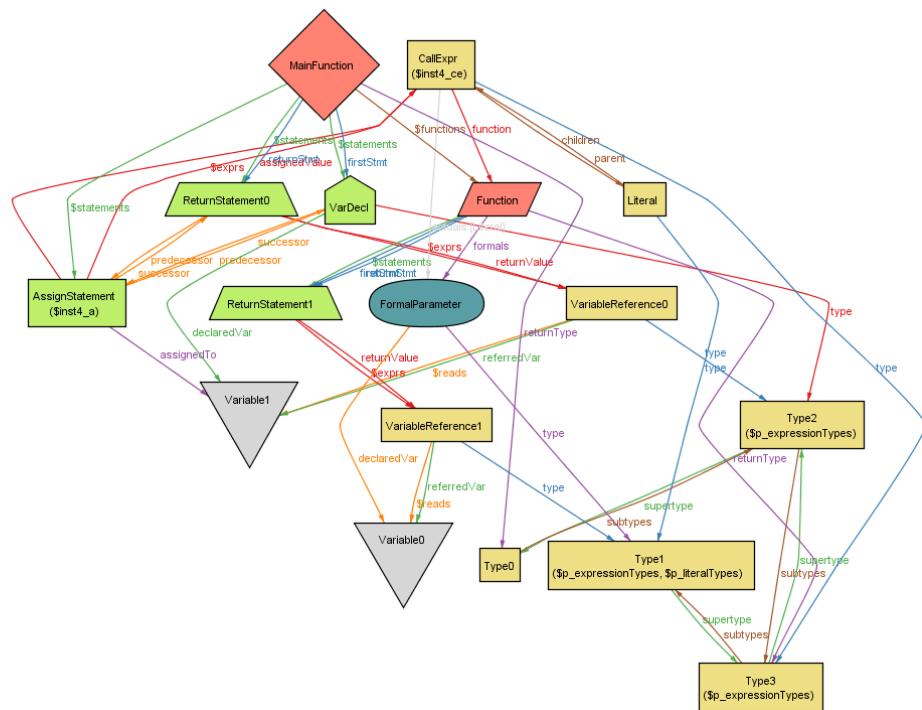


Instance 7

```

$exprs: 3
$functions: 1
$reads: 2
$statements: 4
actuals: 1
assignedValue: 1
children: 1
declaredVar: 1
declaredVar: 1
firstStmt: 2
formals: 1
function: 1
parent: 1
predecessor: 2
referedVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
subtypes: 3
successor: 2
superType: 3
type: 4
type: 1
type: 1

```

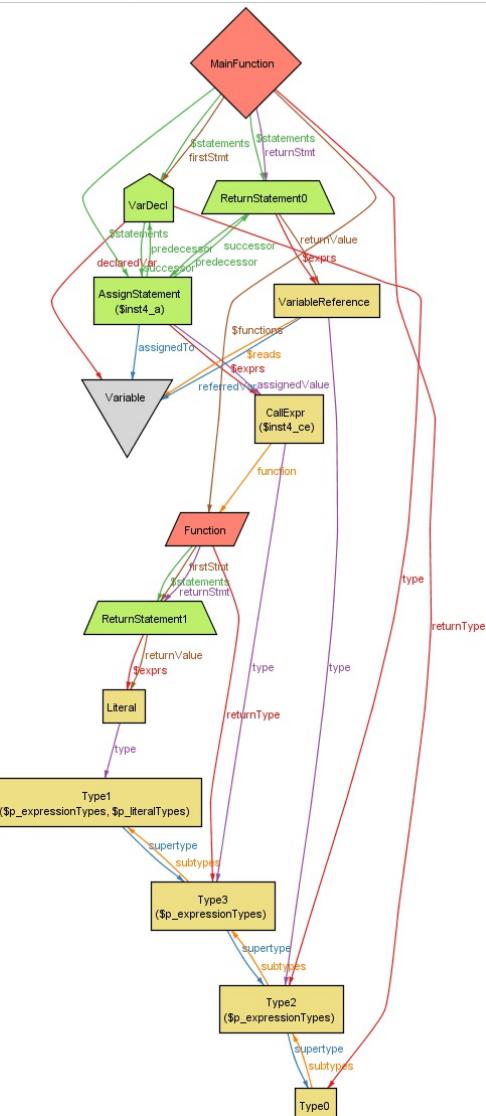


Instance 8

```

$exprs: 3
$functions: 1
$reads: 1
$statements: 4
actuals: 1
assignedValue: 1
declaredVar: 1
firstStmt: 2
function: 1
parent: 1
predecessor: 2
referedVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
subtypes: 3
successor: 2
superType: 3
type: 3
type: 1
type: 1

```

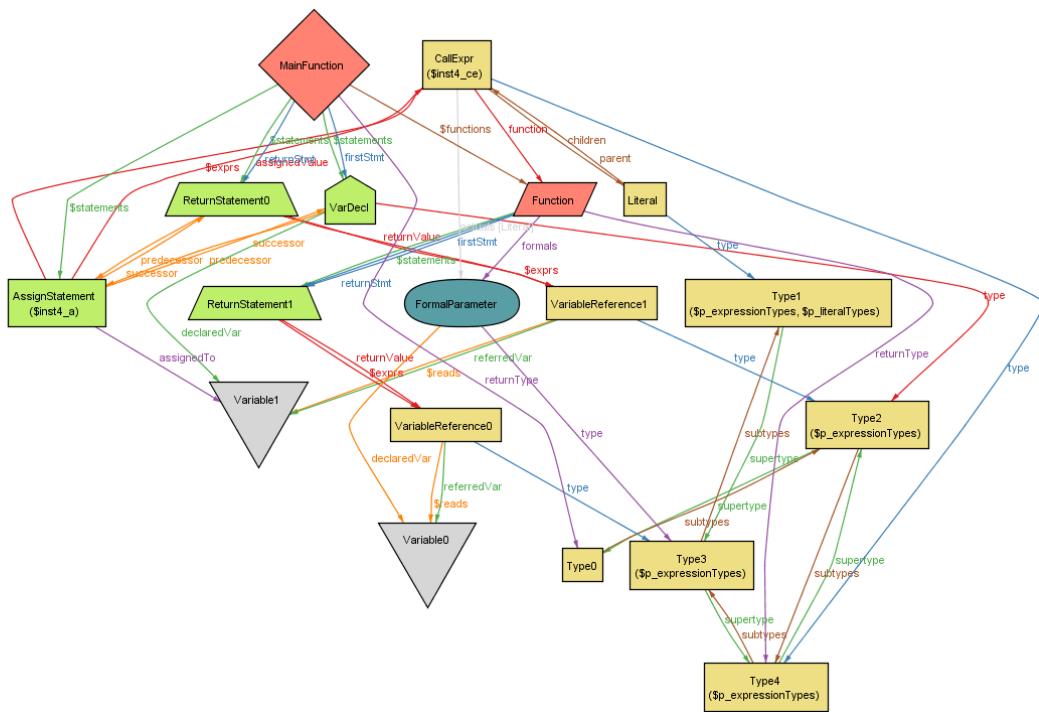


Instance 9

```

$exprs: 3
$functions: 1
$reads: 2
$statements: 4
actuals: 1
assignedTo: 1
assignedValue: 1
children: 1
declaredVar: 1
declarerVar: 1
firstStmt: 2
formals: 1
function: 1
parent: 1
predecessor: 2
referVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
subtypes: 4
successor: 2
superType: 4
type: 4
type: 1
type: 1

```

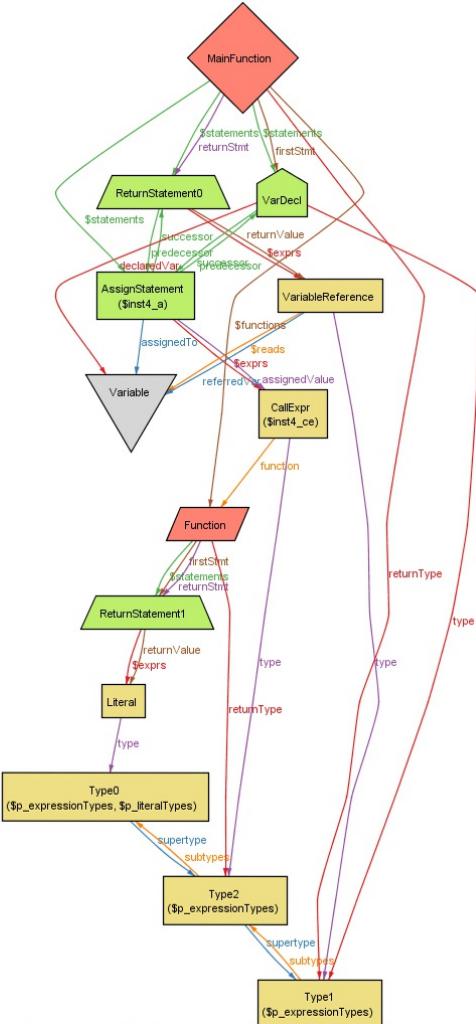


Instance 10

```

$exprs: 3
$functions: 1
$reads: 1
$statements: 4
actuals: 1
assignedTo: 1
assignedValue: 1
declaredVar: 1
firstStmt: 2
function: 1
predecessor: 2
referVar: 2
returnStmt: 2
returnType: 2
returnValue: 2
subtypes: 2
successor: 2
superType: 2
type: 3
type: 1

```



Instances that are not feasible in task E

- Instance 3 is not feasible ...
- Instance 5 is not feasible ...