

Nested Scopes

Carsten Gips (FH Bielefeld)

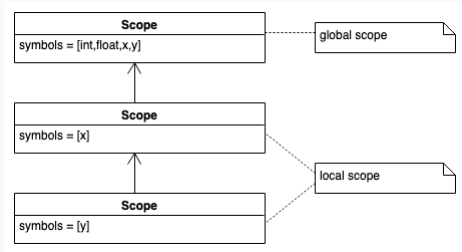
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Symbole und (nested) Scopes

```
int x = 42;  
float y;  
{  
    int x;  
    x = 1;  
    y = 2;  
    { int y = x; }  
}
```

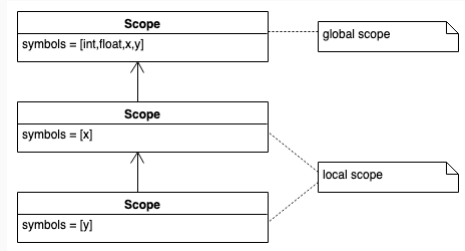
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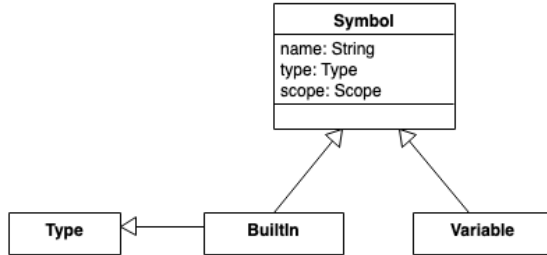


Aufgaben:

- `bind()`: Symbole definieren
- `resolve()`: Symbole abrufen

Nested Scopes: Symbole und Scopes

Scope
enclosingScope: Scope symbols: Map<String, Symbol>
bind(symbol: Symbol): void resolve(name: String): Symbol



Quelle: Eigene Modellierung nach einer Idee in (Parr 2010, 142)

Nested Scopes: Definieren und Auflösen von Namen

```
class Scope:
    Scope enclosingScope    # None if global (outermost) scope
    Symbol<String, Symbol> symbols

    def resolve(name):
        # do we know "name" here?
        if symbols[name]: return symbols[name]
        # if not here, check any enclosing scope
        try: return enclosingScope.resolve(name)
        except: return None    # not found

    def bind(symbol):
        symbols[symbol.name] = symbol
        symbol.scope = self    # track the scope in each symbol
```

Nested Scopes: Listener

```
start    :  stat+ ;

stat     :  block | varDecl | expr ';' ;
block    :  '{' stat* '}' ;

varDecl  :  type ID ('=' expr)? ';' ;
expr     :  var '=' INT ;

var      :  ID ;
type     :  'float' | 'int' ;
```

```
int x = 42;

{ int y = 9; x = 7; }
```

```
class MyListener(BaseListener):
    Scope scope

    def enterStart(Parser.FileContext ctx):
        globals = Scope()
        globals.bind(BuiltIn("int"))
        globals.bind(BuiltIn("float"))
        scope = globals

    def enterBlock(Parser.BlockContext ctx):
        scope = Scope(scope)

    def exitBlock(Parser.BlockContext ctx):
        scope = scope.enclosingScope

    def exitVarDecl(Parser.VarDeclContext ctx):
        t = scope.resolve(ctx.type().getText())
        var = Variable(ctx.ID().getText(), t)
        scope.bind(var)

    def exitVar(Parser.VarContext ctx):
        name = ctx.ID().getText()
        var = scope.resolve(name)
        if var == None: error("no such var: " + name)
```

- Symboltabellen: Verwaltung von Symbolen und Typen (Informationen über Bezeichner)
- Blöcke: Nested Scopes => hierarchische Organisation
- Binden von Bezeichner gleichen Namens an ihren jeweiligen Scope => `bind()`
- Abrufen von Bezeichnern aus dem aktuellen Scope oder den Elternscopes => `resolve()`

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