Variables in Pharo5

ESUG 2015

Marcus Denker

http://www.pharo.org

Everything is an Object

Everything?

Classes, yes.

Methods, yes

But Variables?

Everything is an object?

```
SmalltalkImage classVarNamed: #CompilerClass
  ==> returns value

Object binding class
 ==> Association
```

Why not an Object?

Globals/ClassVariables

- We are close: bindings are associations
- Add sublass “LiteralVariable”
- Sublasses GlobalVariable, ClassVariable
- Enhance API

Globals/ClassVariables

SmalltalkImage classVariableNamed: #CompilerClass

Object binding class

Globals: Reflective APi

```
global := SmalltalkImage classVariableNamed:
#CompilerClass
```

```
global read
global write: someObject
```

+ helper methods + compatibility methods

Everything is an object?

- Point instanceVariables
- 5@3 instVarNamed: ‘x’
- 5@3 instVarNamed: ‘y’ put: 6

Why not an Object?

Slots

```
Point slots

(Point slotNamed: #x) read: (3@4)

(Point slotNamed: #x) write: 7 to: (3@4)
```

Variables+MetaLink

- Helper methods

  Point assignmentNodes

- But: can’t we annotate variables directly?

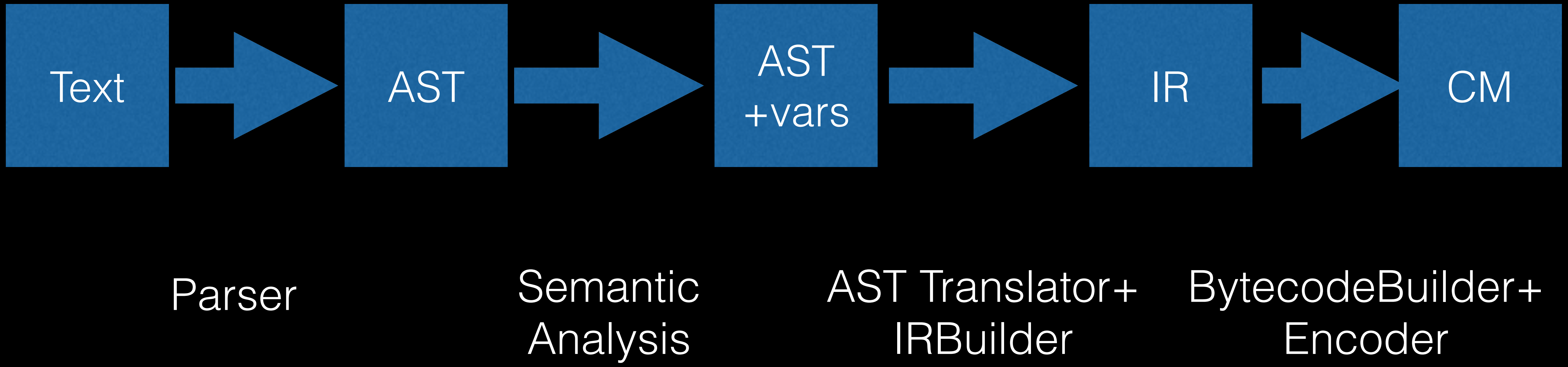
Variables + Links

- Object binding link: myMetaLink
- (Point slotNamed: #x) link: myMetaLink

(not yet in Pharo5)

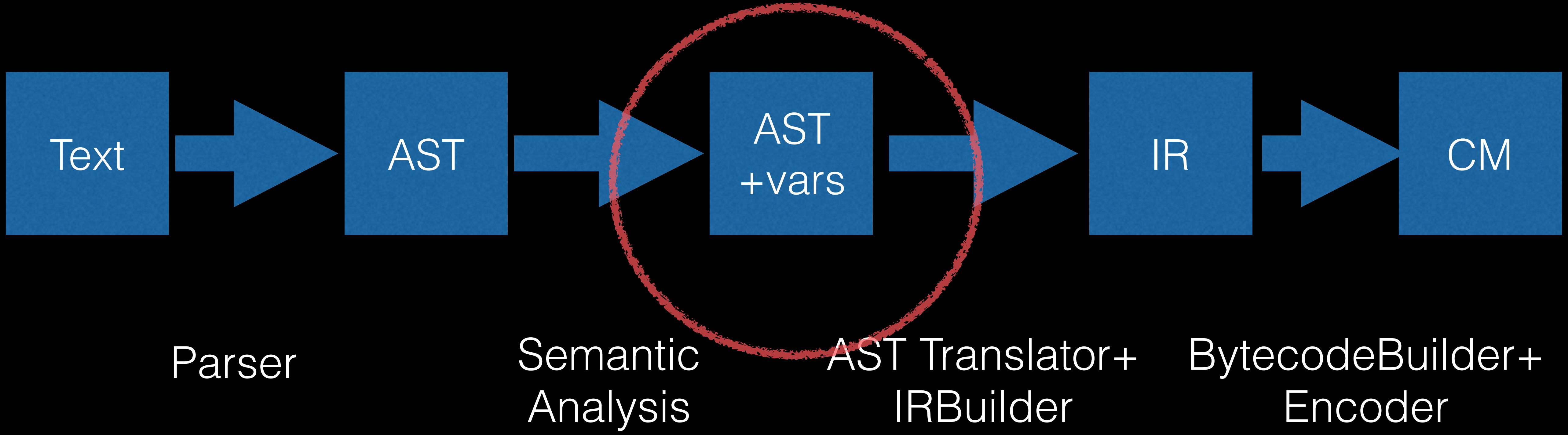
Opal Compiler

- Uses RB AST
- Based on Visitors



Opal Compiler

- Name analysis finds the variables
- Code generator can delegate to them



Gobals: code read

- By default compile reflective read

```
emitValue: aMethodBuilder
  aMethodBuilder
  pushLiteralVariable: #slot->self;
  send: #read
```

Gobals: code write

- By default compile reflective write

```
emitStore: aMethodBuilder
   | tempName |
   tempName := Object new.
   aMethodBuilder
      addTemp: tempName;
      storeTemp: tempName;
      popTop;
      pushLiteralVariable: #global -> self;
      pushTemp: tempName;
      send: #write:
```

Gobals: code write

- ClassVariable and GlobalVariable override

```
emitStore: methodBuilder

    methodBuilder storeIntoLiteralVariable: self.
```

Same for Slots

- Slot generates reflective read/write
- InstanceVariableSlot overrides for fast instance access via byte code

What does that mean?

- Slots and Globals are instances of a class
- The compiler delegates code generation to the variable meta object
- Which means: We can define our own variables!

Class Template

```
Object subclass: #Point
    slots: { #x. #y }
    classVariables: {  }
    category: 'Kernel-BasicObjects'
```

Class Template

```
Object subclass: #MyClass
    slots: { #x => WeakSlot }
    classVariables: {  }
    category: 'Example'
```

Examples: DEMO

- Simple Slot
- WeakSlot
- Property Slot
- Boolean

RoadMap

- Pharo3:
  - Layout+Slots (hidden), Opal
- Pharo4
  - Slots: Monticello support, class template
- Pharo5
  - Remove old Compiler/AST
  - Slots + Reflectivity: First finished version

RoadMap

- Pharo6:
  - Library of useful Slots
  - Use e.g. Property Slots in Bloc/Morphic

Future

- Can’t we model bit patterns and bind them to named virtual slots?
- How to model Array-like layouts better?

Thanks!

- Work of many people…
- special thanks to… Toon Verwaest, Camillo Bruni, Martin Dias, Stephane Ducasse, Max Mattone and Camille Teruel

Questions ?