A bytecode set for adaptive optimizations

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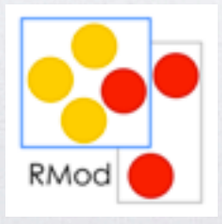


Introduction

- The Cog VM is the standard VM for:
  - Pharo
  - Squeak
  - Newspeak

Introduction

- Working runtime bytecode to bytecode optimizer for Cog's JIT

- The optimizer
  - depends the bytecode set quality
  - needs new bytecode instructions

Introduction

- Design of a new bytecode set

Plan

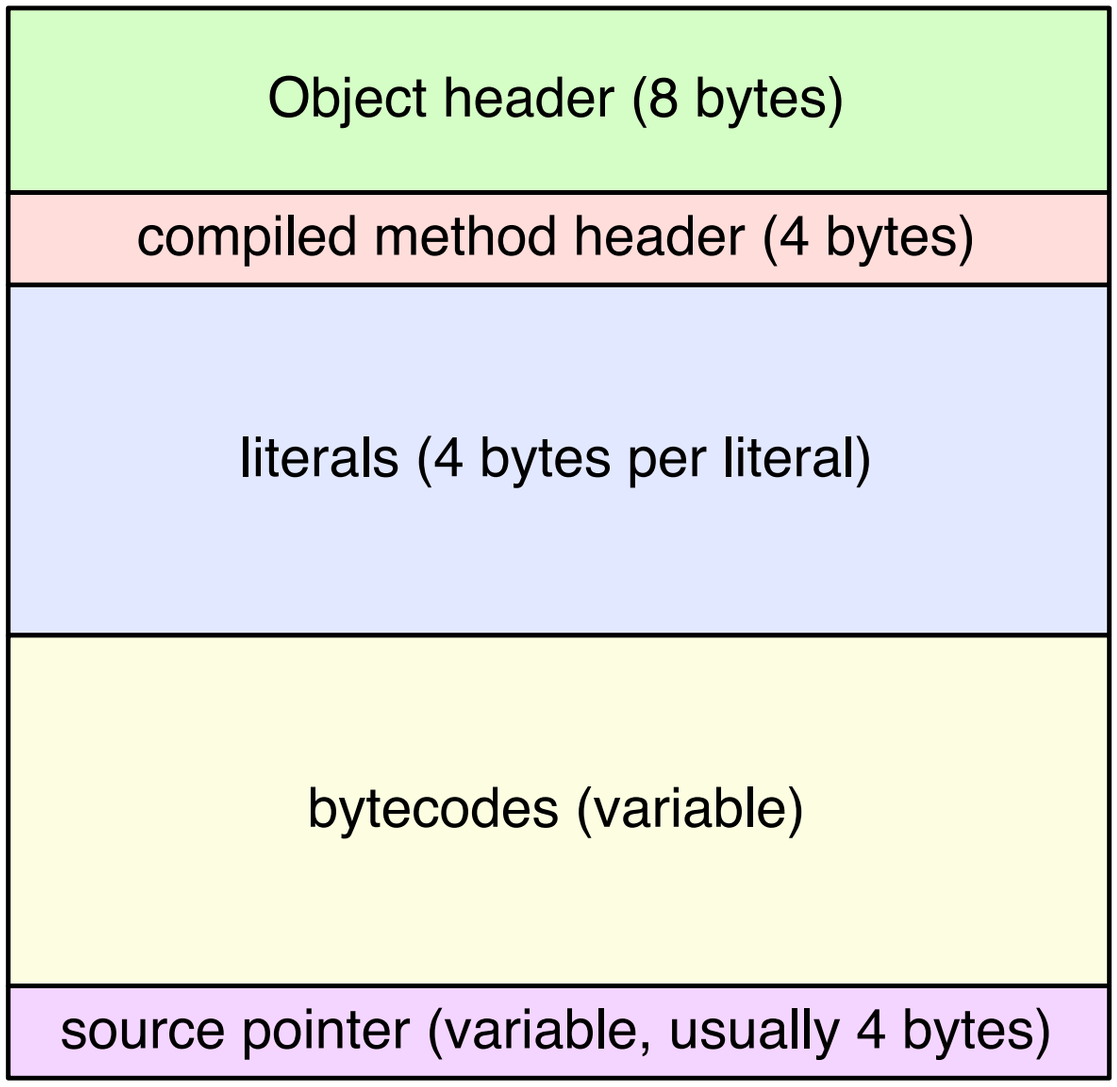
- Context
- Challenges for a good bytecode set
- Current Issues
- New bytecode set
- Switching between bytecode sets

Context

- Compiled methods are objects

- Shared between the VM and the image

Memory representation of Compiled Method in 32 bits with the new Memory Manager Spur



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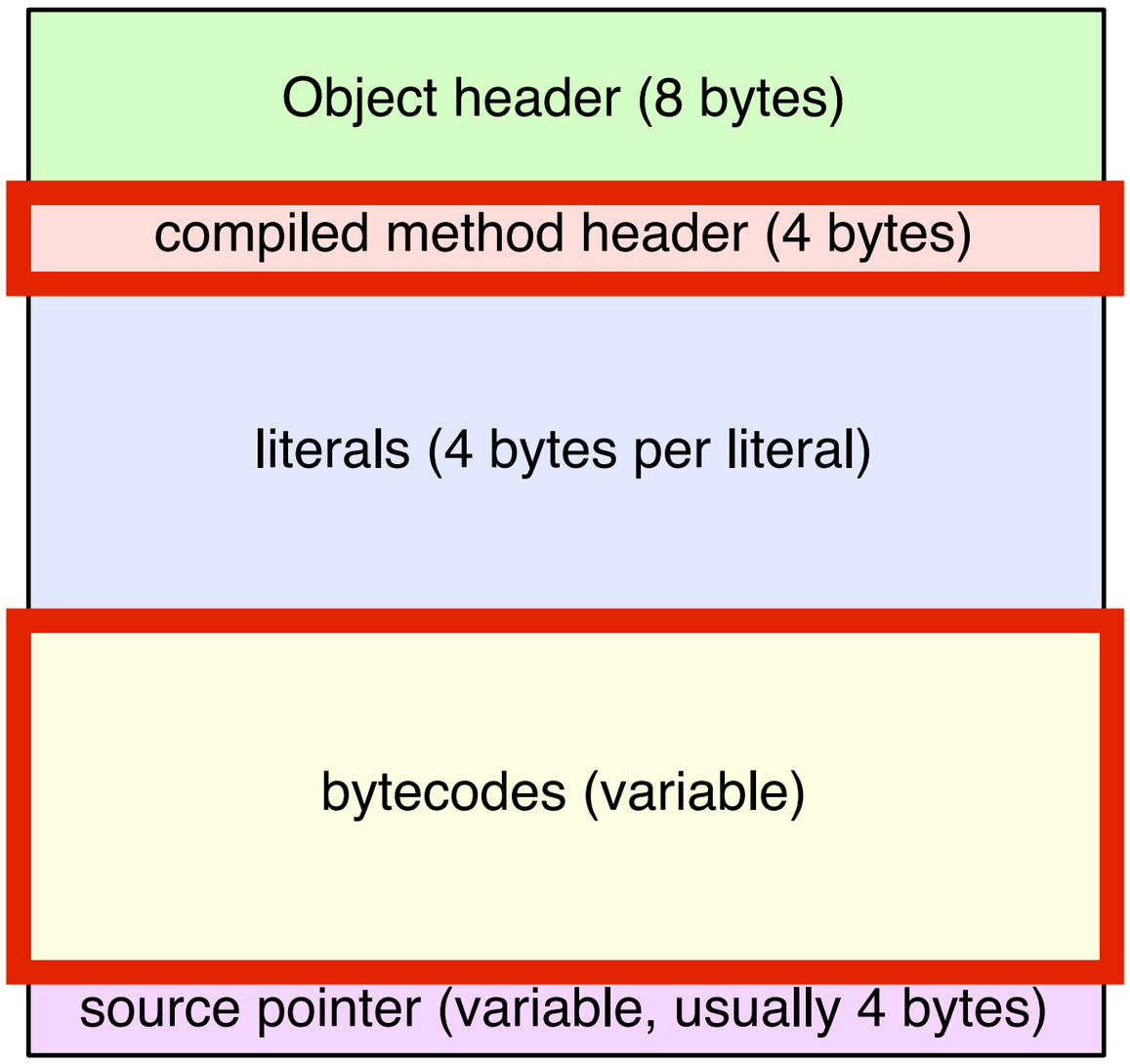

Bytecode set

- Stack based
- Interpreted by the StackInterpreter
- Compiled to machine code by Cogit
- Generated by the in-image compiler

Challenges

- Generic challenges
- Challenges for the bytecode optimizer

Generic challenges

- Platform-independent
- Compact
- Easy to decode
- Backward compatibility

Optimizer challenges

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Optimizer

Thursday there's a talk about it.

- Inlining
- Primitive specialization

Optimizer challenges

- Inlined primitives / unsafe operations
- Large methods
- Access to non receiver instance variable
- Extendable

Current issues

- Large method unsupported
- Few available bytes
- Primitive encoding forbidding inlining
- DoubleExtendedDoAnything bytecode
- Immediate objects compaction
- Late addition of the closure bytecode

New bytecode set

- Extendable instructions (prefix)
- Inlined primitives / unsafe operations
- Extendable (available bytes)
- Maximum number of literals increased

New bytecode set

- Overall bytecode size smaller
- Immediate objects compaction
- Easier decoding
  - Sorted by number of bytes
  - Sorted by functionalities
- Closure decoding improved

Bytecode set switch

- Offline converter: hard to debug

- VM supporting two bytecode set

- Bit in compiled method header

Conclusion

- Designed a bytecode set for runtime bytecode to bytecode optimizations
- Next step is to work on the optimizer
  - Come at my talk thursday about it

Questions

RMod

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