A Block-Based Bytecode Format

to Simplify and Improve Just-in-Time Compilation

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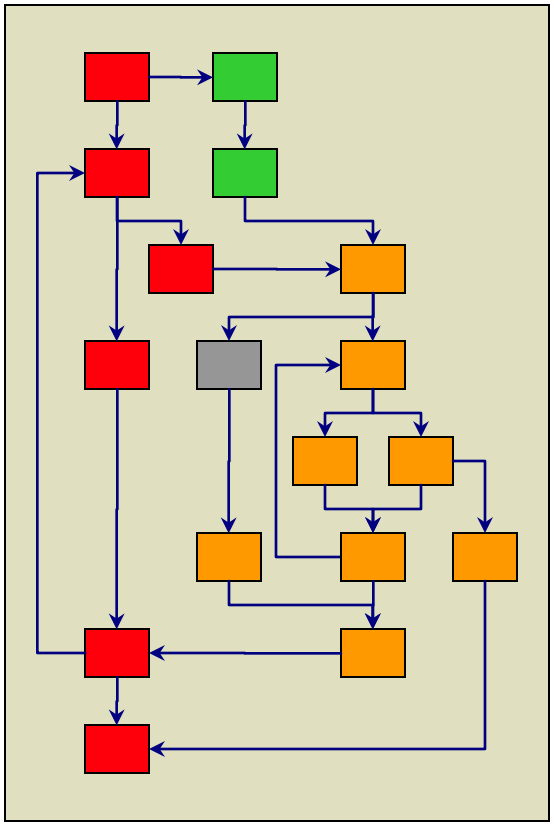
Method Granularity

Software Engineering

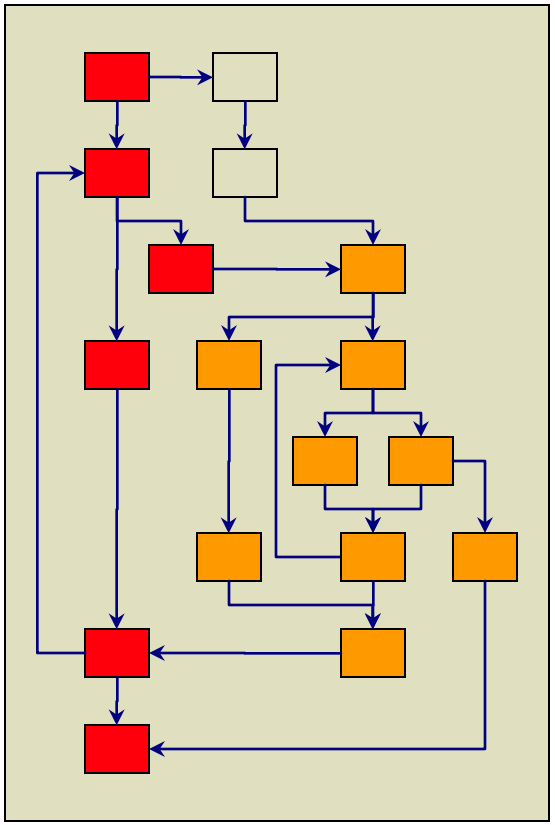


Unstructured Bytecodes
Method Granularity

JIT Compiler Design derived from Static Compilers

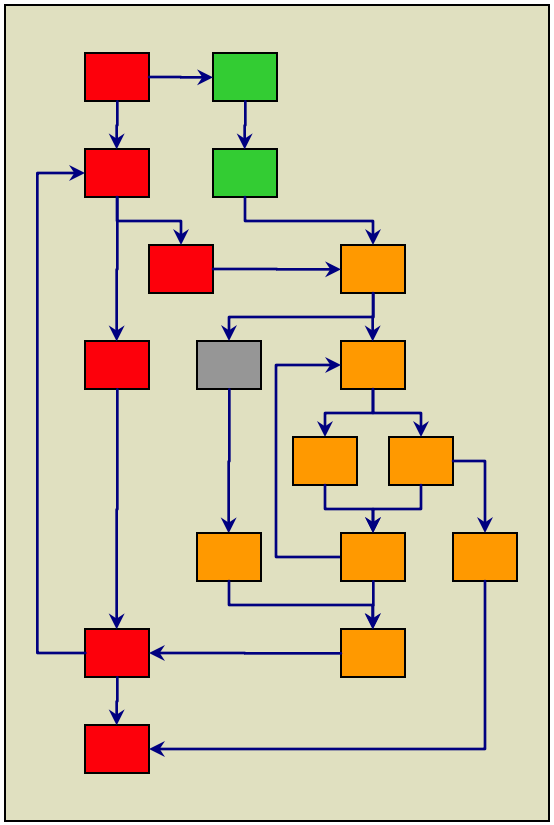
Method Structure used in Compiler because "it's there"

Compiler Optimization



Block Granularity

Software Engineering

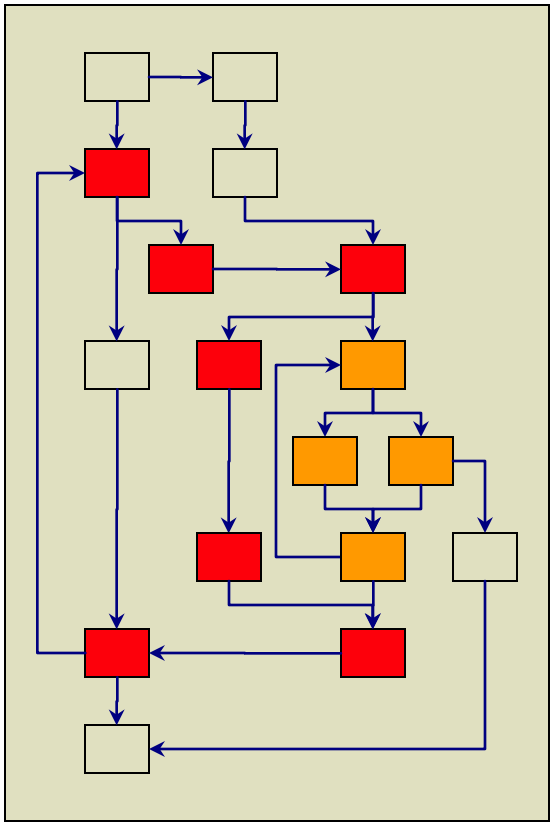


Block-Based Bytecodes with Structure Information

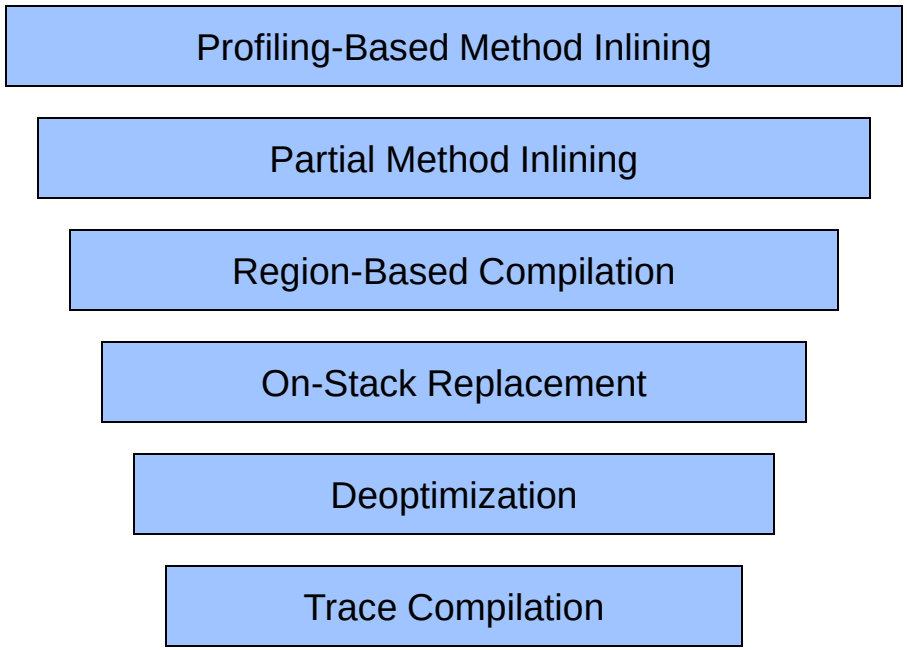
Novel JIT Compilation Strategies using Profiling Data

Compilation Units based on Execution Frequency

Compiler Optimization



Compiler Research



Main Idea and Challenges

Definition of a Block-Based Bytecode Format

Execution in Virtual Machine

- Efficient Interpretation
- Simple Compilation
- Profile Information
- Trace Compilation

Source Languages

- For Static and Dynamic Languages
- Functional Languages
- Dynamic Method Calls
- Closures, Tail Calls, …

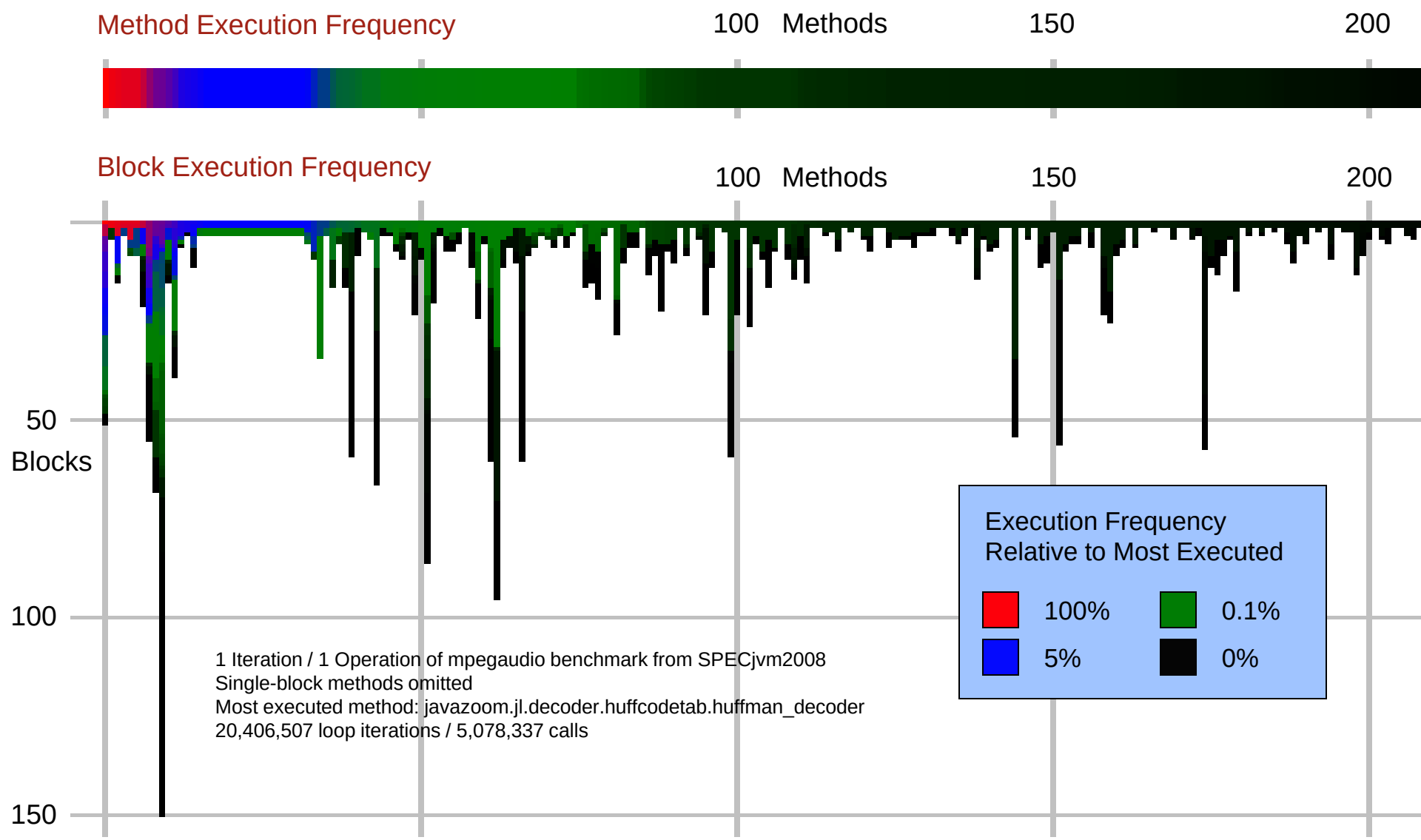
Design Decisions

- High-Level Structure, e.g., Loops
- “Calling Convention” of Blocks
- Stack Based vs. Register Based
- Static Single Assignment Form?

Safety and Security

- Easy Verification
- Inherently Safe Code Formats

SPECjvm2008 – mpegaudio



Summary

Software Engineering	Compiler Optimization
Method Structuring	Block Structuring
Readability	Execution Frequency
Extendibility	Feedback-Directed Optimization
Reusability	Profiling
…	…

Methods hide the real focus where compiler optimizations should be applied