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G1: To Infinity and Beyond

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Agenda

- GC in OpenJDK
- Short intro to G1
- Progress since JDK 8
- The future

GC in OpenJDK

Introduction

GC in OpenJDK

- Fast allocation
- Efficient reclamation
- Concepts and tradeoffs
  - Throughput
  - Latency
  - Footprint

Current Collectors

GC in OpenJDK

Collector name	Status	Comment
Serial	Supported	Low memory footprint
Parallel	Supported	Throughput oriented
G1	Supported/Default	Balanced performance
ZGC	Experimental	Low latency
Shenandoah	Experimental	Low latency
~~CMS~~	Removed in JDK 14	Unmaintained

Short intro to G1

Basic idea

Short intro to G1

- Balance between throughput and latency
- Region based
- Concurrent marking
- Main tuning knob: pause-time goal

Current status

Short intro to G1

- Supported since JDK 7u4
- Default since JDK 9
- Stable and mature
- Continuously being improved

Progress since JDK 8

Overview

Progress since JDK 8

- 700 enhancements since JDK 8
- Significant improvements
- Across all areas
- Cut away old tradeoffs

Throughput

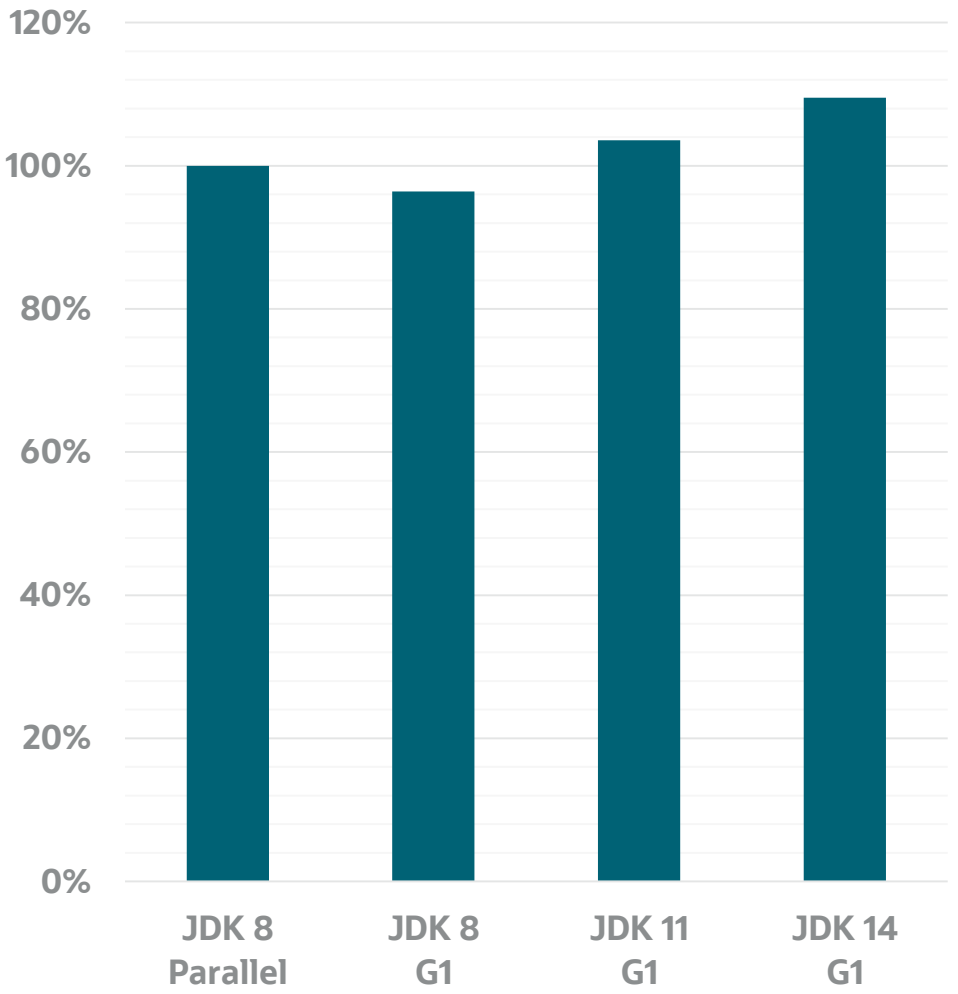
Progress since JDK 8

- Improved NUMA awareness
- More efficient concurrent work
- Parallel Full collection

Throughput

Progress since JDK 8

- SPECjbb® 2015 results
- 16GB heap
- Not only GC improvements
- More time spent running Java



Latency

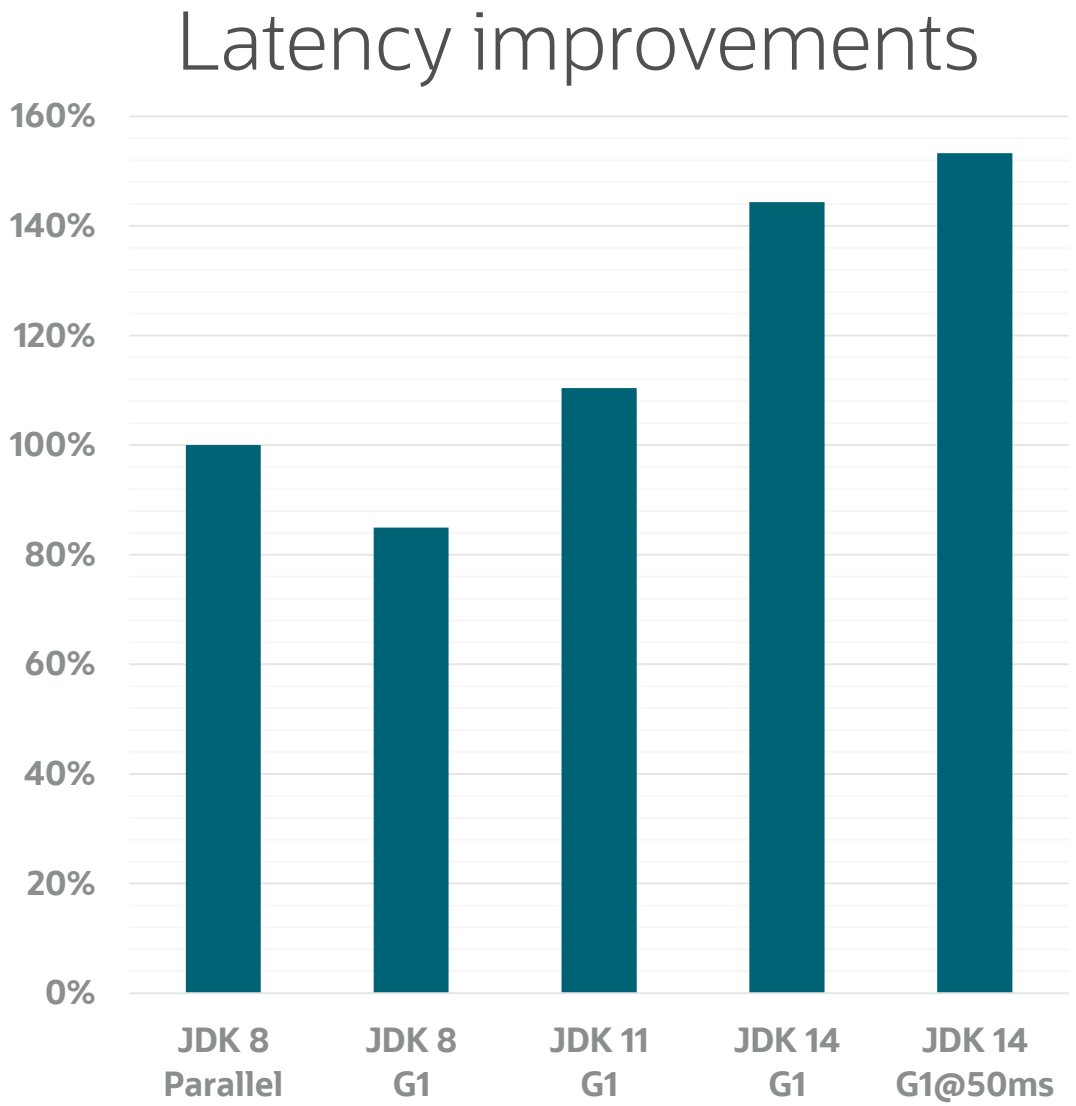
Progress since JDK 8

- Improved parallelism
- More efficient reference processing
- Better pause time predictions
- Abortable mixed collections

Latency

Progress since JDK 8

- SPECjbb® 2015 results
- 16GB heap
- Mostly GC improvements
- Trade throughput for latency



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For more information about SPECjbb, see www.spec.org/jbb2015/.

Footprint

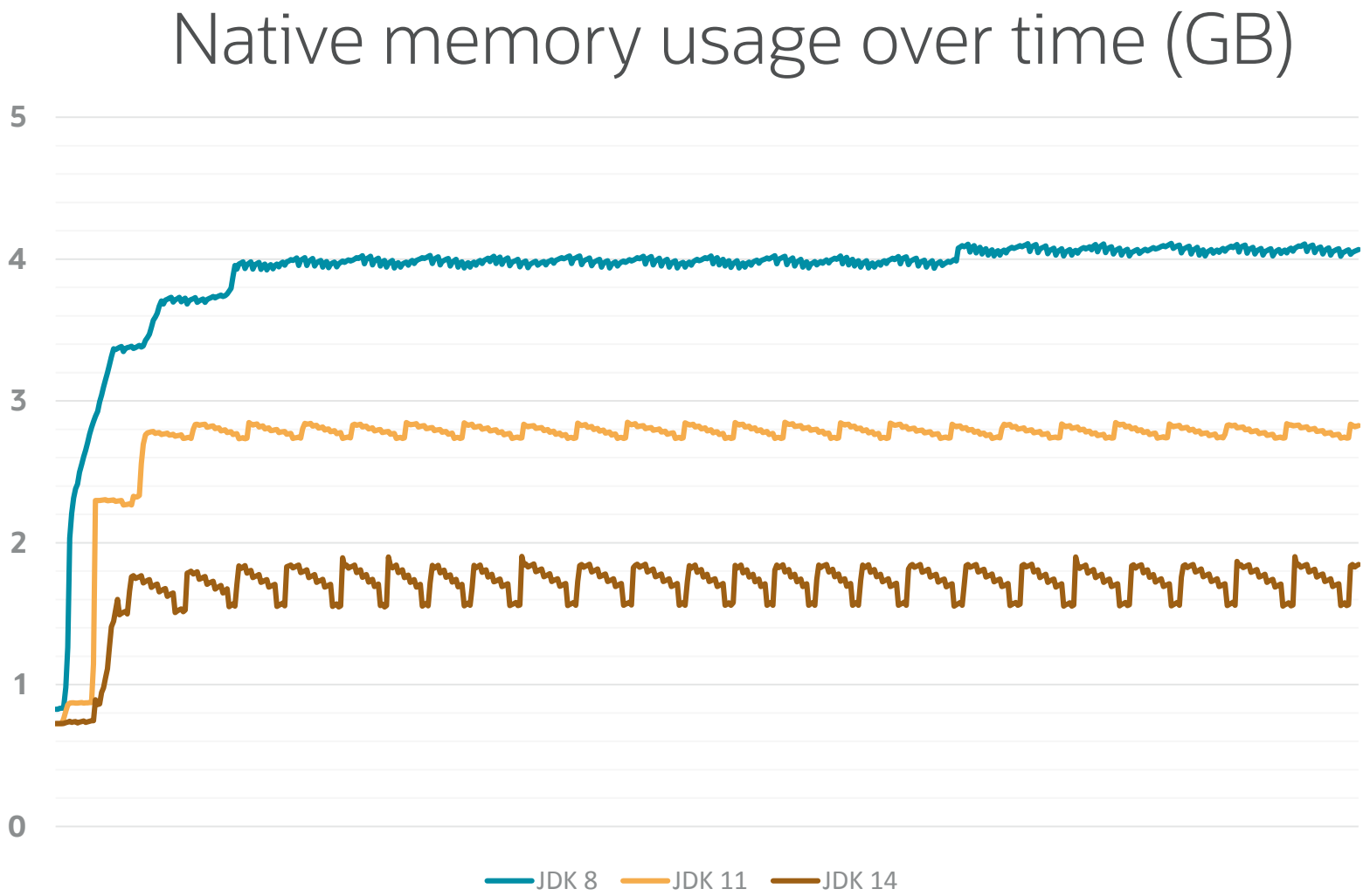
Progress since JDK 8

- Rebuild remembered sets concurrently
- Improved sizing ergonomics
- Return memory to the operating system

Footprint

Progress since JDK 8

- BigRamTester
- 16GB heap



The Future

Investigations

The Future

- Humongous object handling
- Improved write barrier
- Footprint reductions

Key take aways

To Infinity and Beyond

- Massive improvements since JDK 8
- Exciting features in the pipe

Questions

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