An investigation into the warmup behaviour of various virtual machines

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Goal

- measure “warmup”
- completely unclear how

VMs

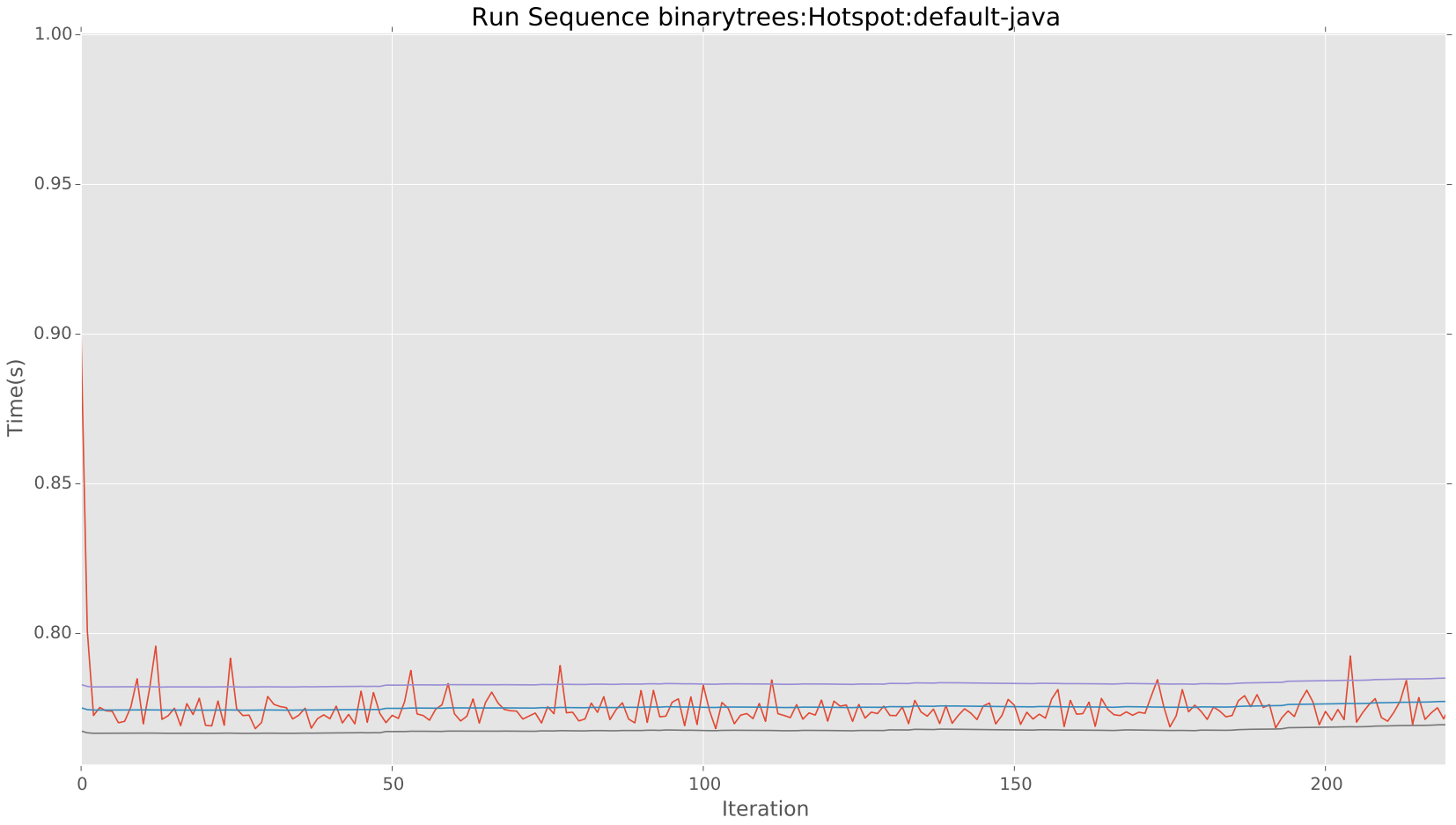
- Hotspot JVM
- Graal JVM
- JRuby Truffle
- V8
- LuaJIT
- HHVM
- PyPy
- CPython

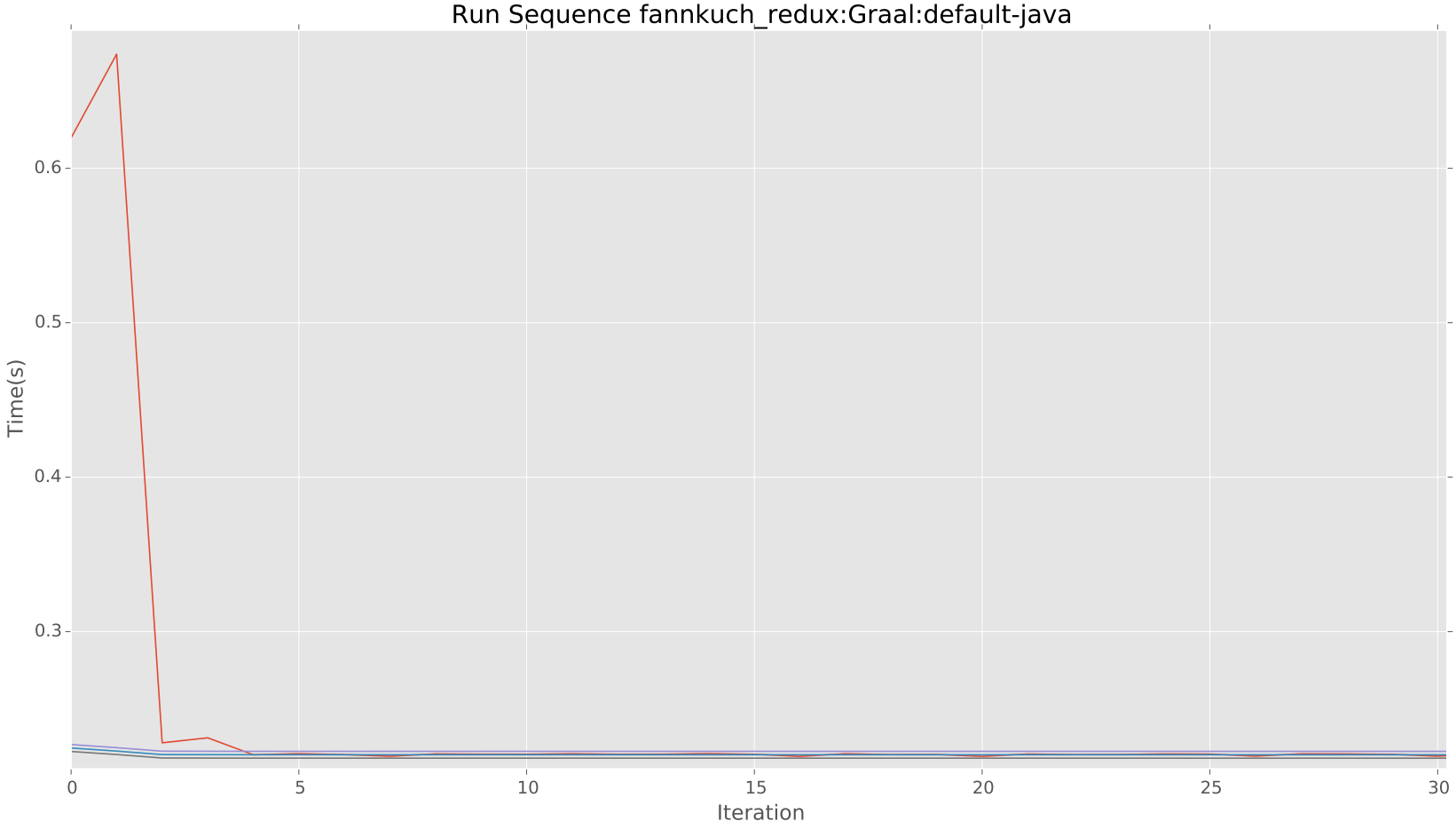
Benchmarks

- binarytrees
- fannkuchredux
- fasta
- nbody
- richards
- spectralnorm

What we hope to see

- some slow iterations (ideally one)
- fast iterations
- maybe another slow one
- very fast ones, with some noise

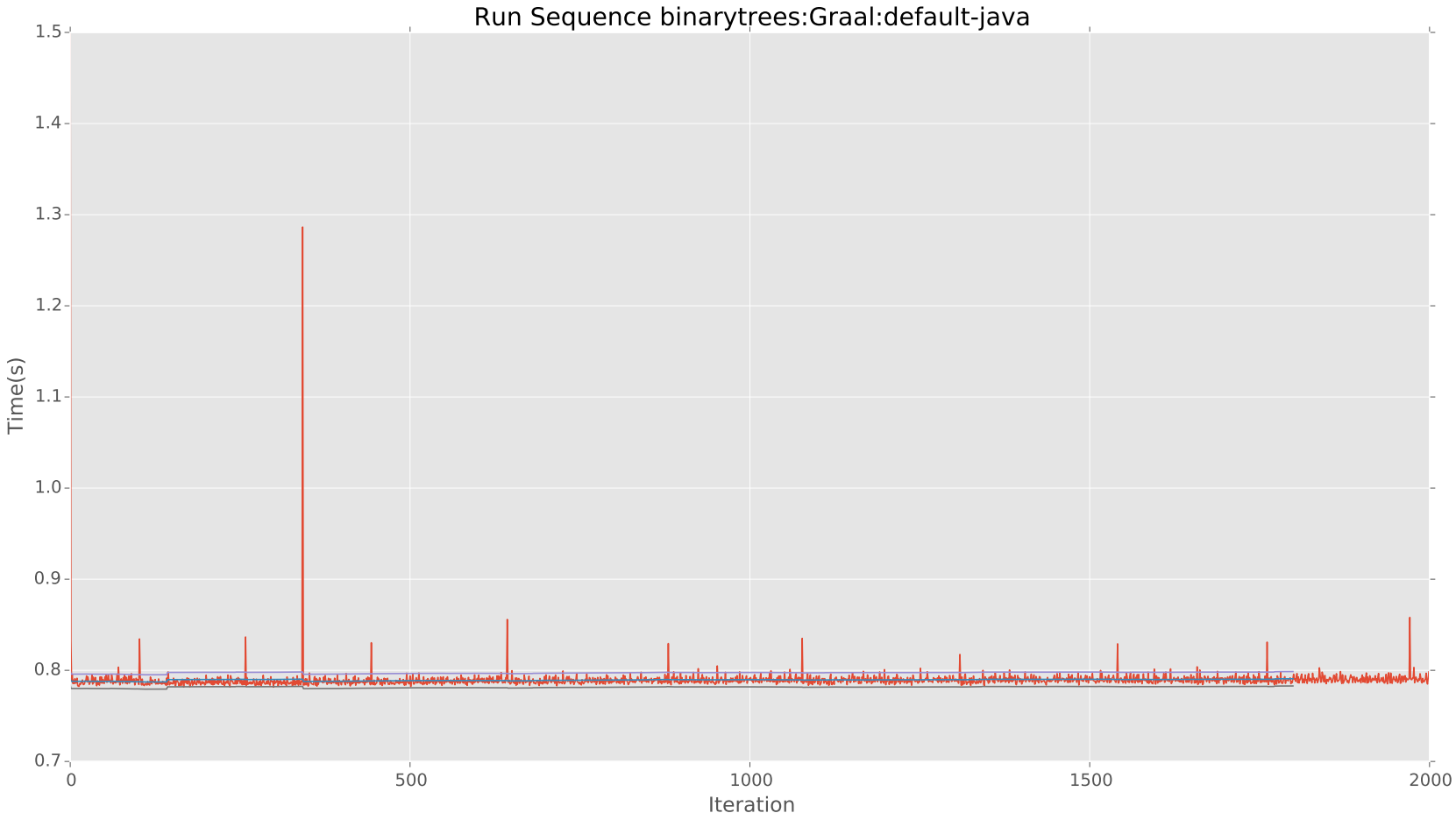

Run Sequence binarytrees:Hotspot:default-java
1.00
0.95
0.90
0.85
0.80
Time(s)
0
50
100
150
200
Iteration

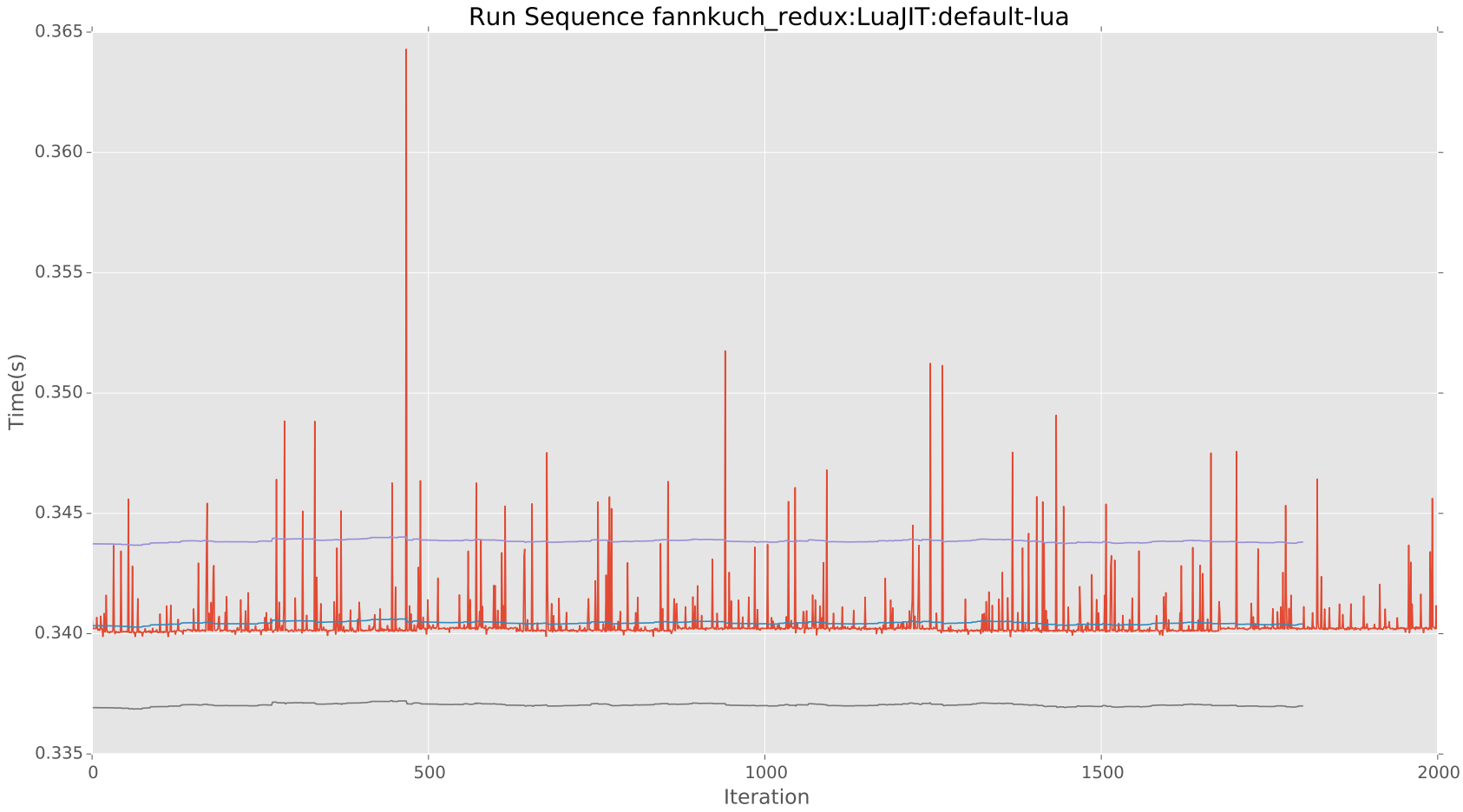

Run Sequence fannkuch_redux:Graal:default-java
Time(s)
0.6
0.5
0.4
0.3
0
5
10
15
20
25
30
Iteration

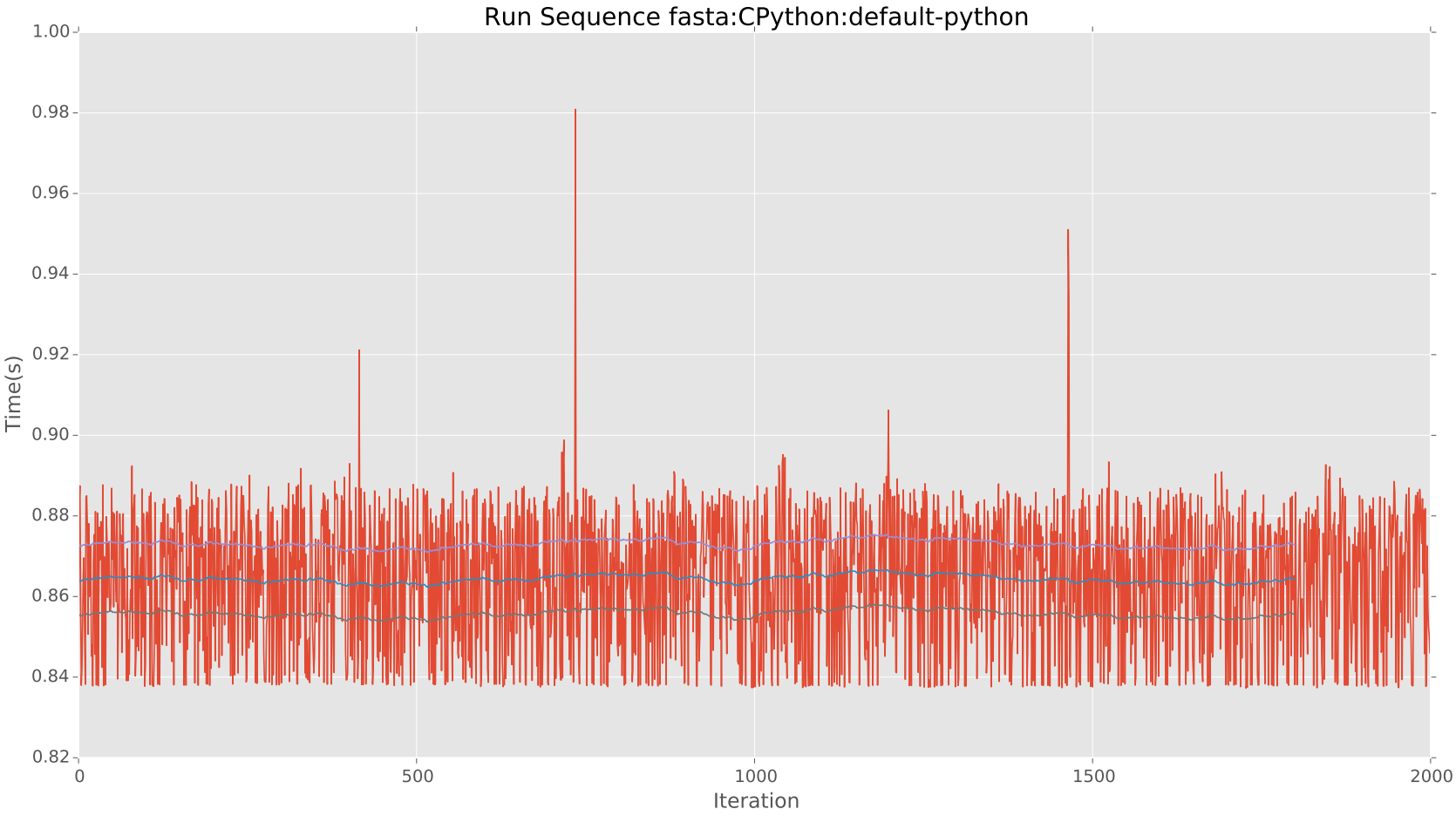
Weird things we find in practice

- outliers
- slowdowns
- late phase changes
- cyclic behaviour

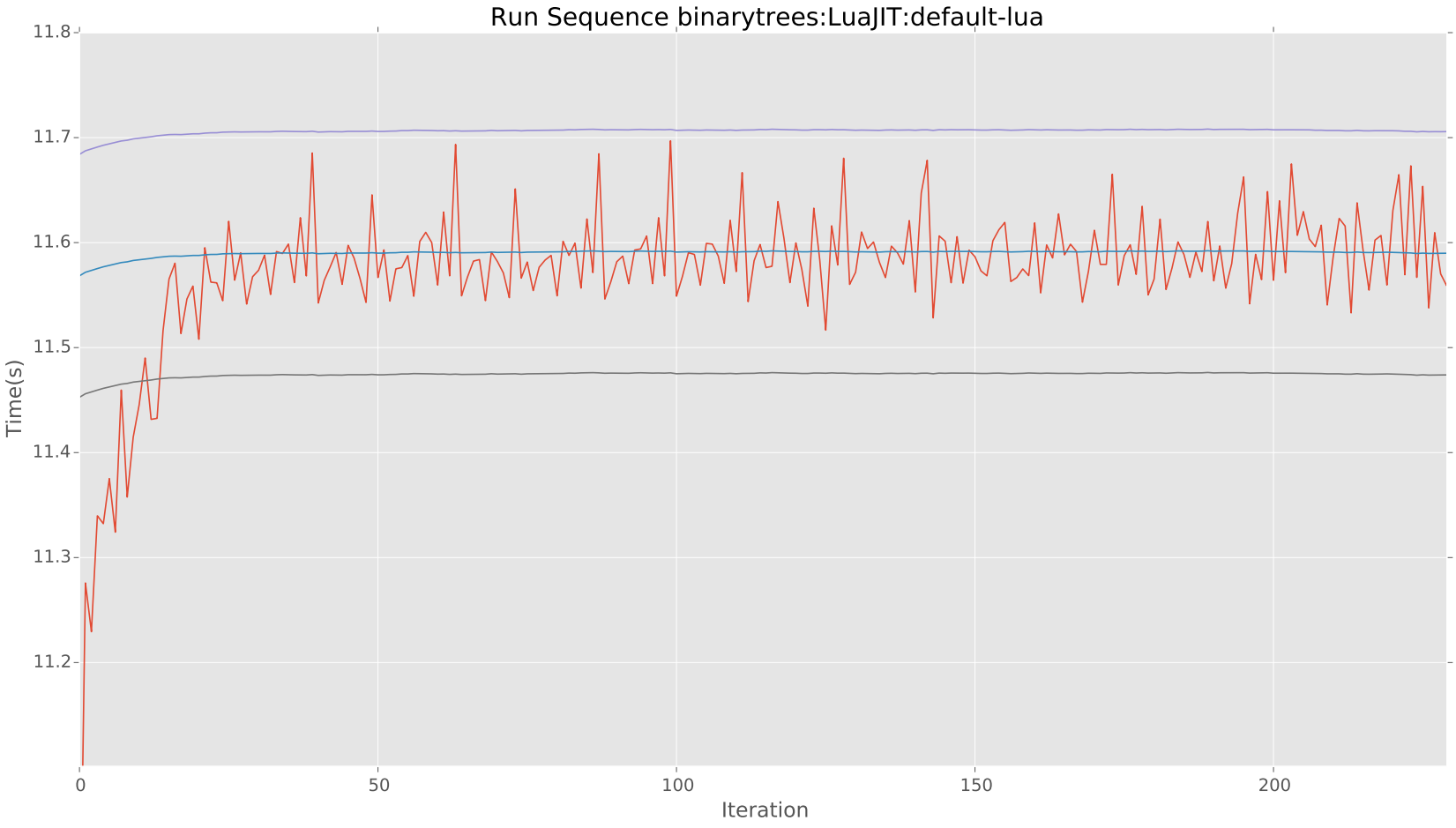
Outliers


Run Sequence binarytrees:Graal:default-java
Time(s)
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0
500
1000
1500
2000
Iteration

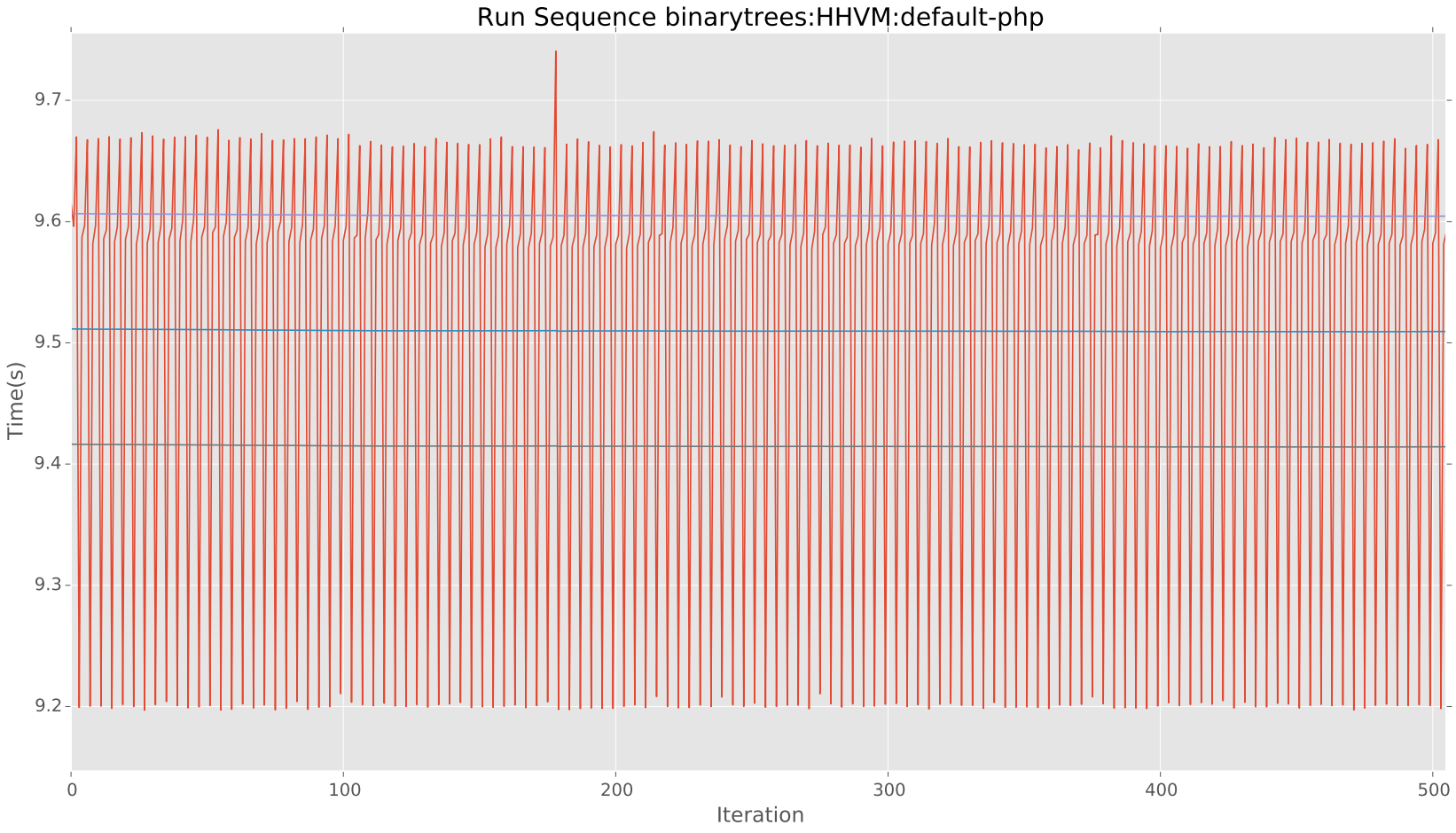

Run Sequence fannkuch_redux:LuaJIT:default-lua
Time(s)
0.365
0.360
0.355
0.350
0.345
0.340
0.335
0
500
1000
1500
2000
Iteration

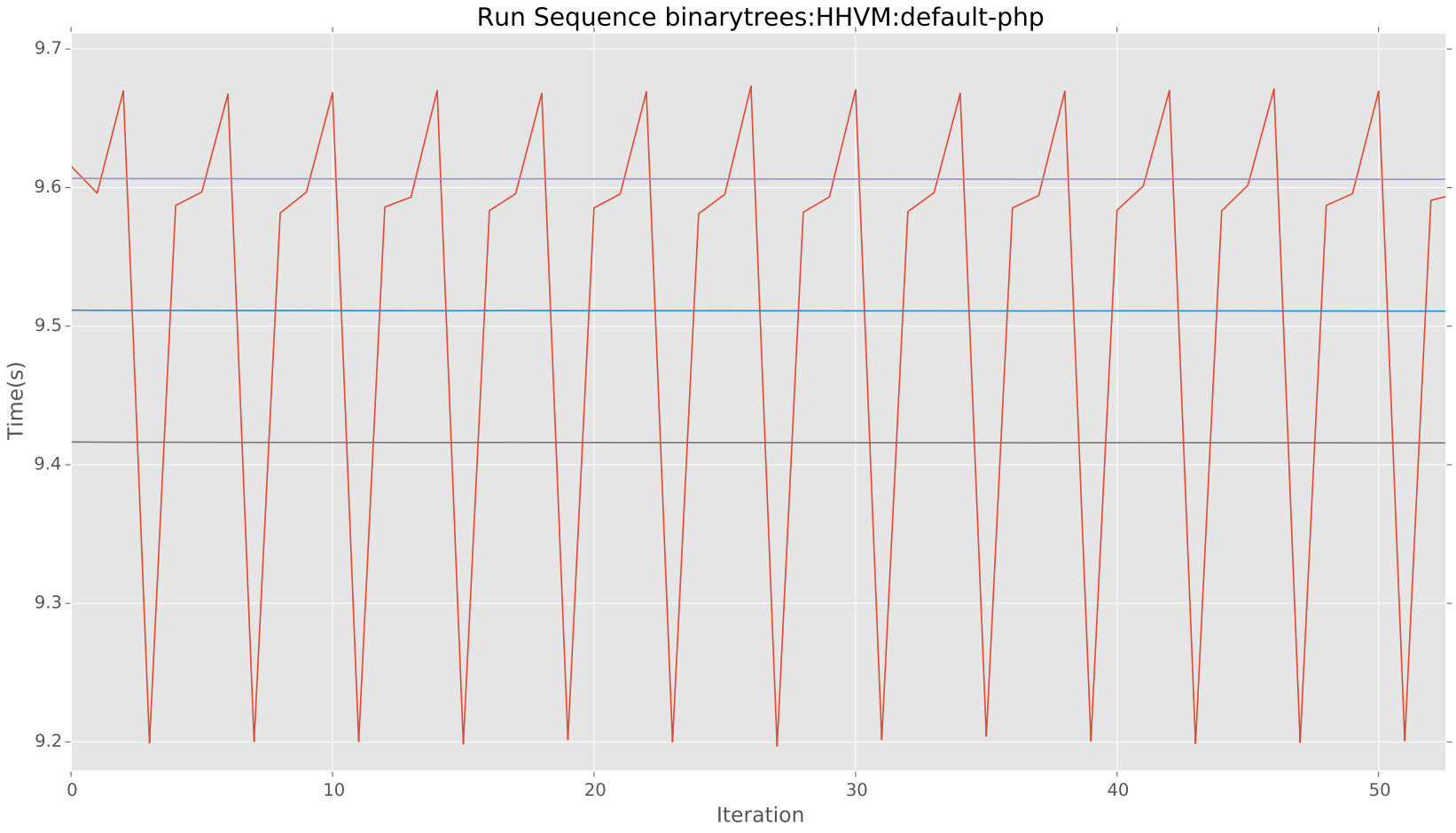

Run Sequence fasta:CPython:default-python
Time(s)
1.00
0.98
0.96
0.94
0.92
0.90
0.88
0.86
0.84
0.82
0
500
1000
1500
2000
Iteration

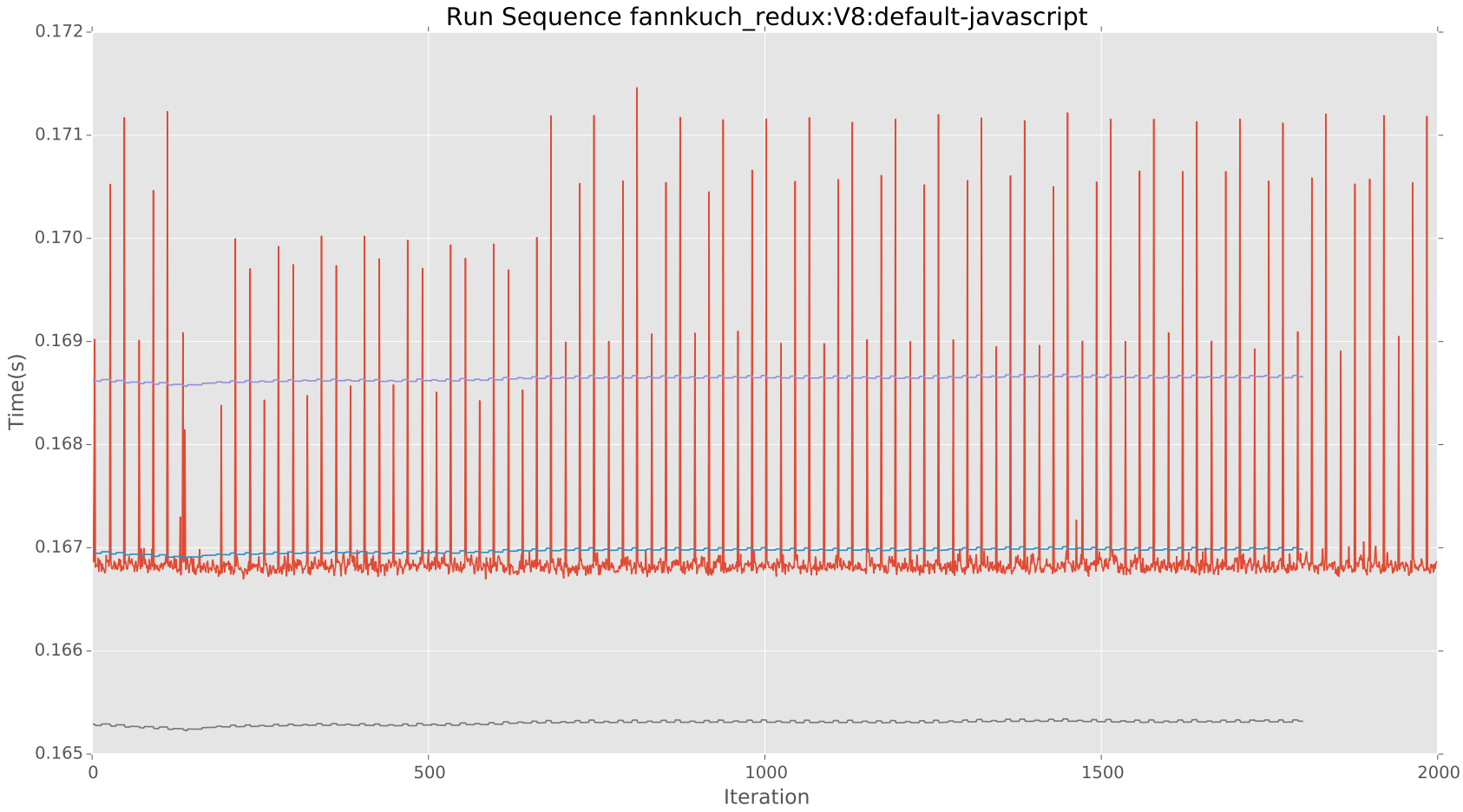
Slowdowns

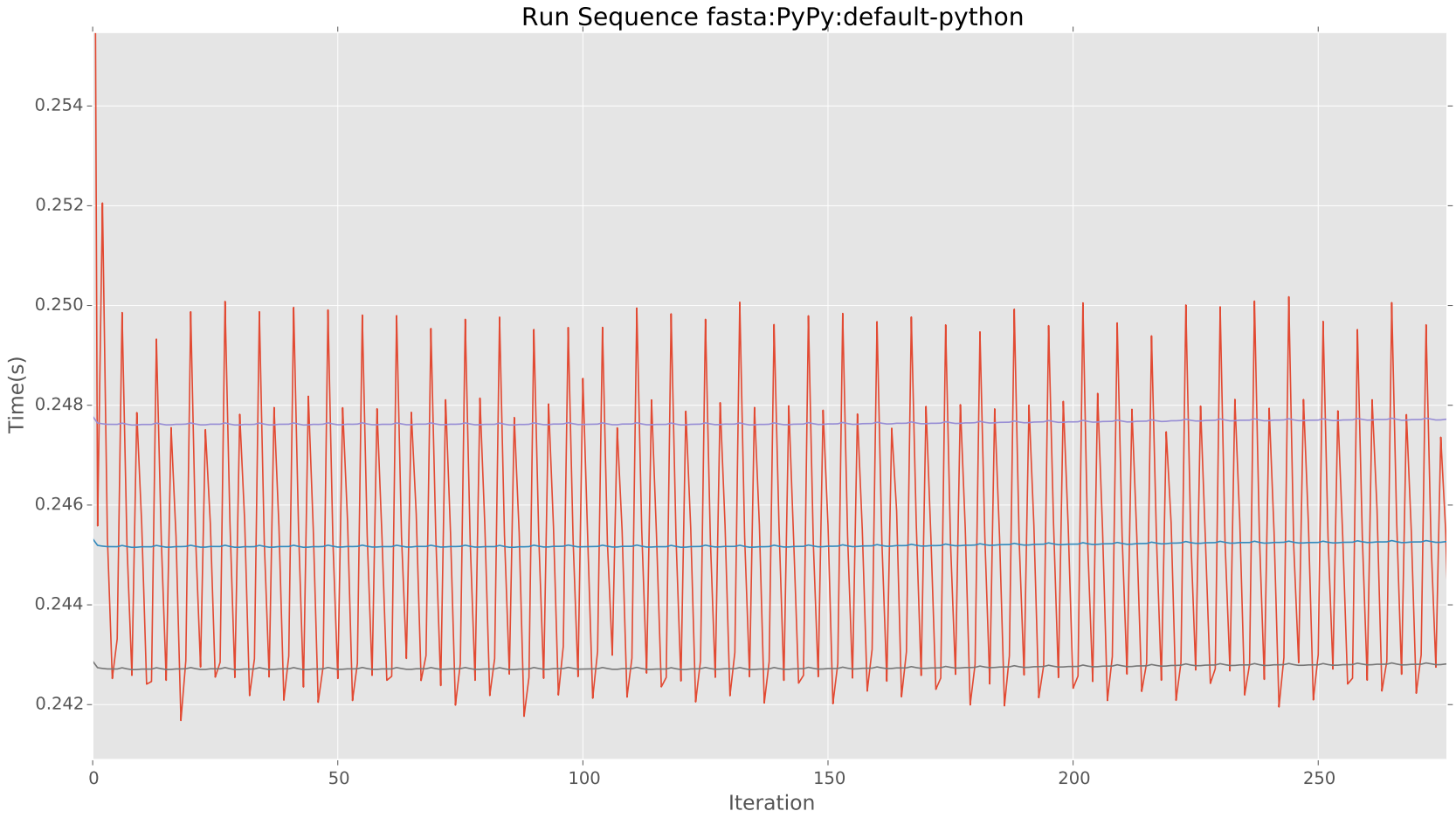

Run Sequence binarytrees:LuaJIT:default-lua
Time(s)
11.8
11.7
11.6
11.5
11.4
11.3
11.2
0
50
100
150
200
Iteration

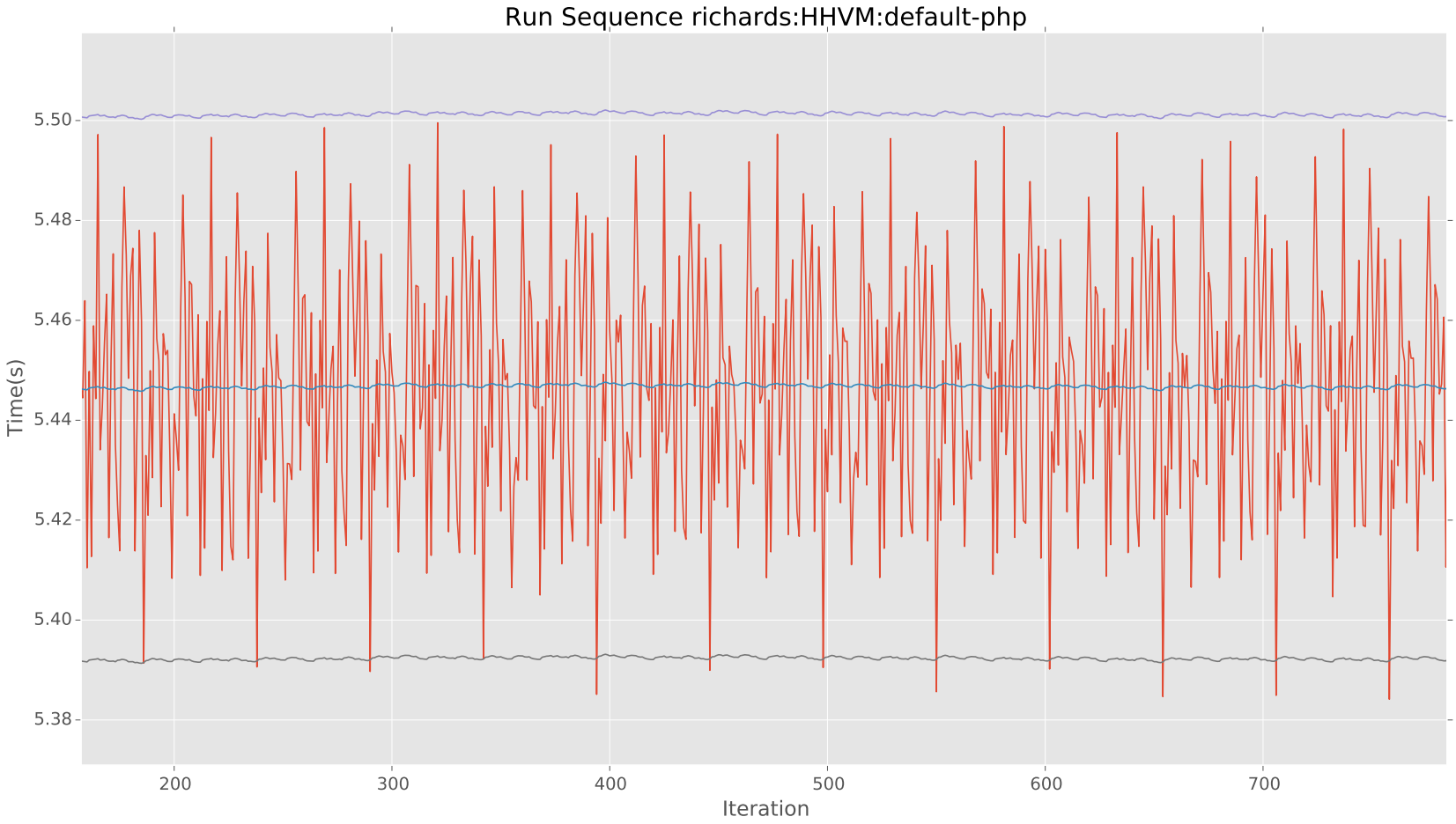
Cyclic behaviour


Run Sequence binarytrees:HHVM:default-php
Time(s)
9.7
9.6
9.5
9.4
9.3
9.2
0
100
200
300
400
500
Iteration

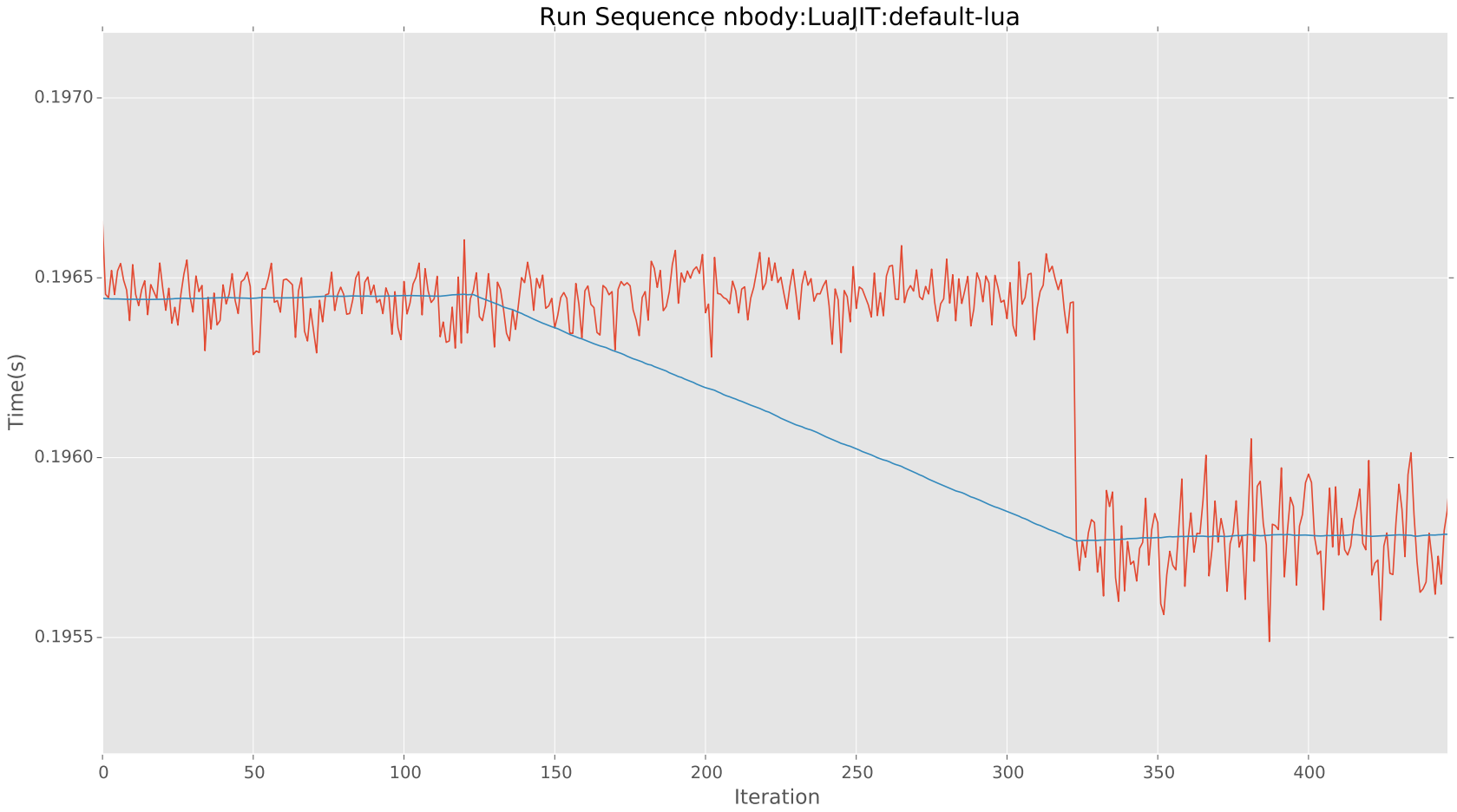

Run Sequence binarytrees:HHVM:default-php
Time(s)
9.7
9.6
9.5
9.4
9.3
9.2
0
10
20
30
40
50
Iteration

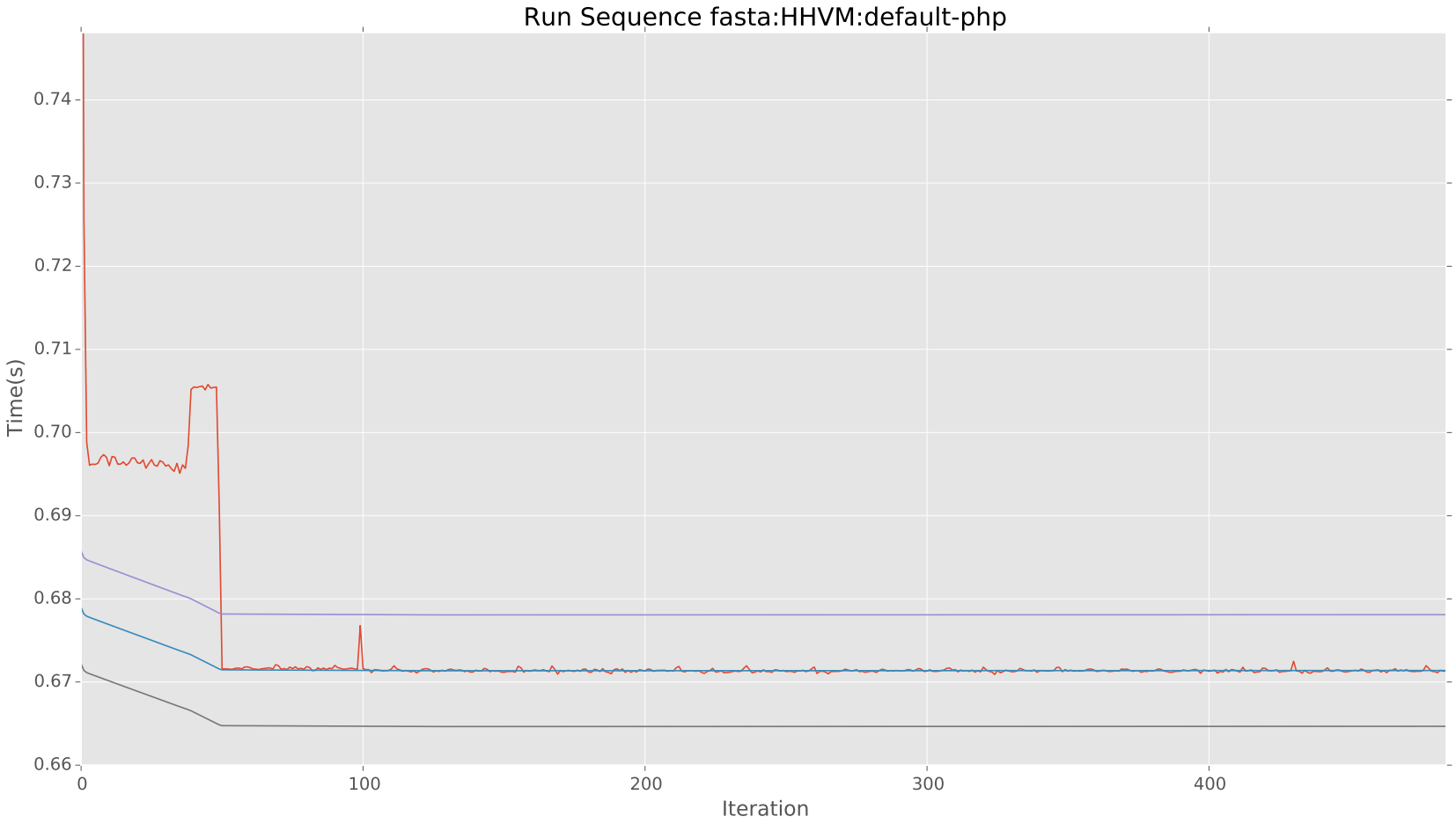

Run Sequence fannkuch_redux:V8:default-javascript
Time(s)
0.172
0.171
0.170
0.169
0.168
0.167
0.166
0.165
0
500
1000
1500
2000
Iteration

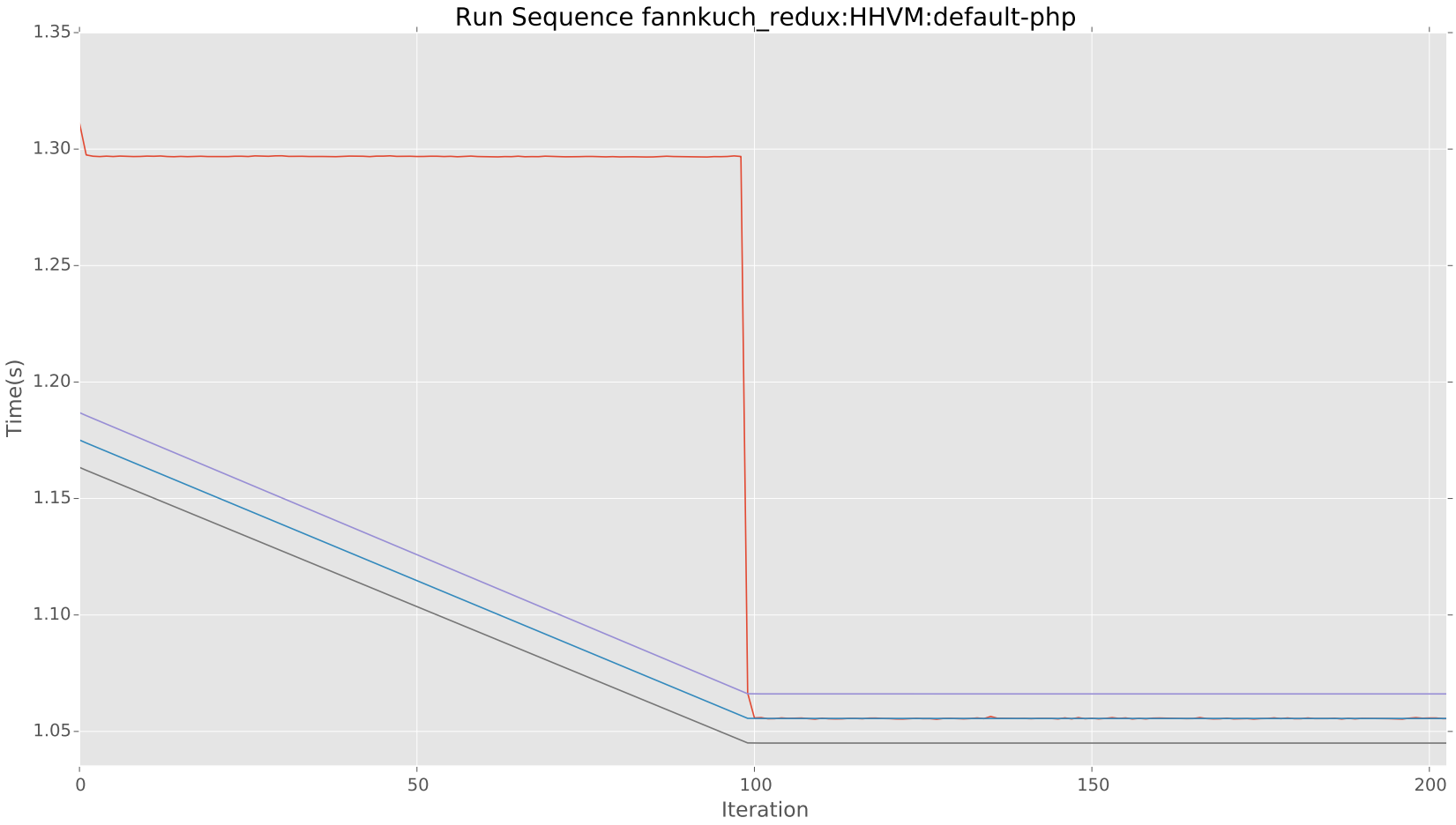

Run Sequence fasta:PyPy:default-python
Time(s)
0.254
0.252
0.250
0.248
0.246
0.244
0.242
0
50
100
150
200
250
Iteration

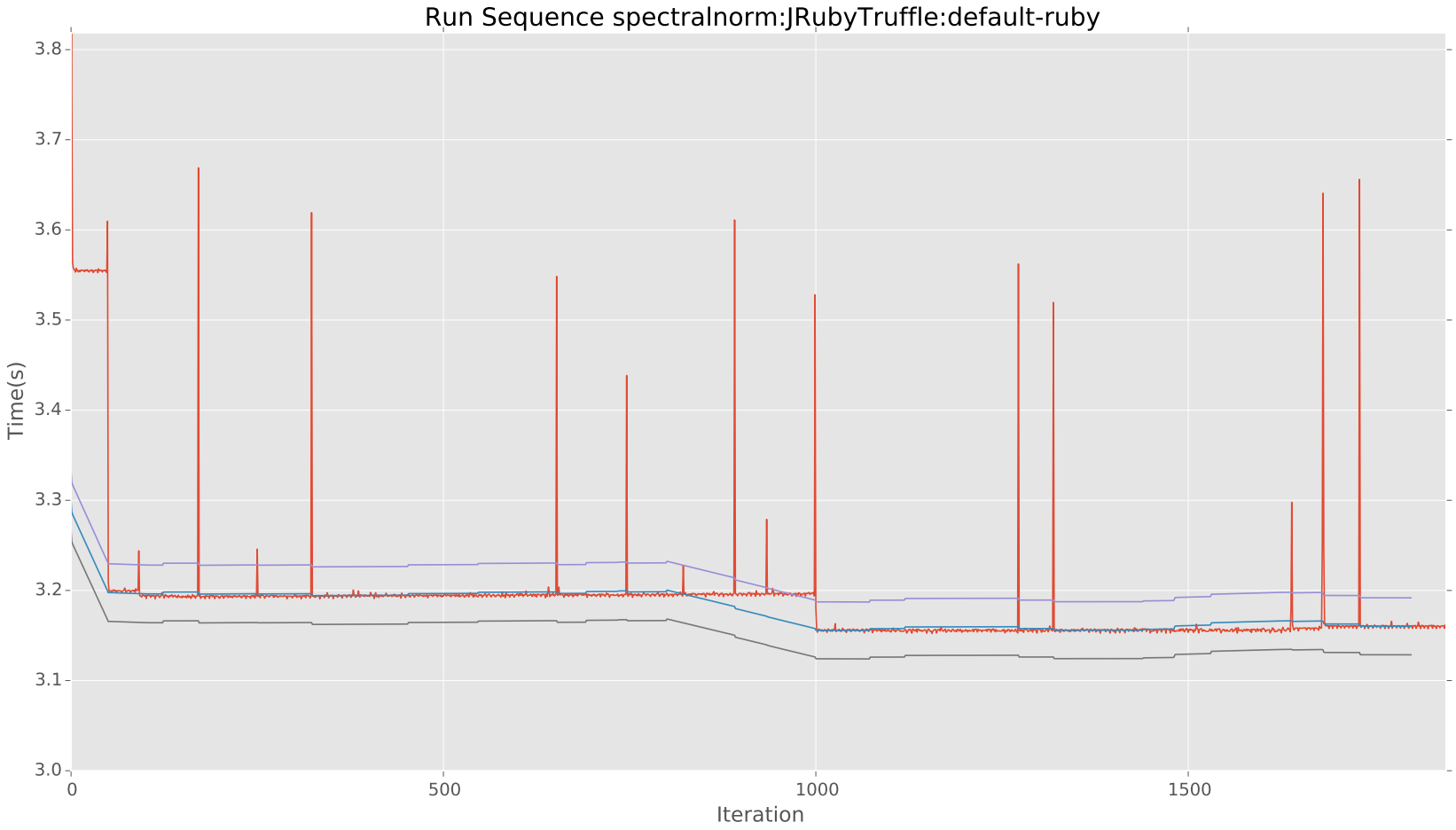

Run Sequence richards:HHVM:default-php
Time(s)
5.50
5.48
5.46
5.44
5.42
5.40
5.38
200
300
400
500
600
700
Iteration

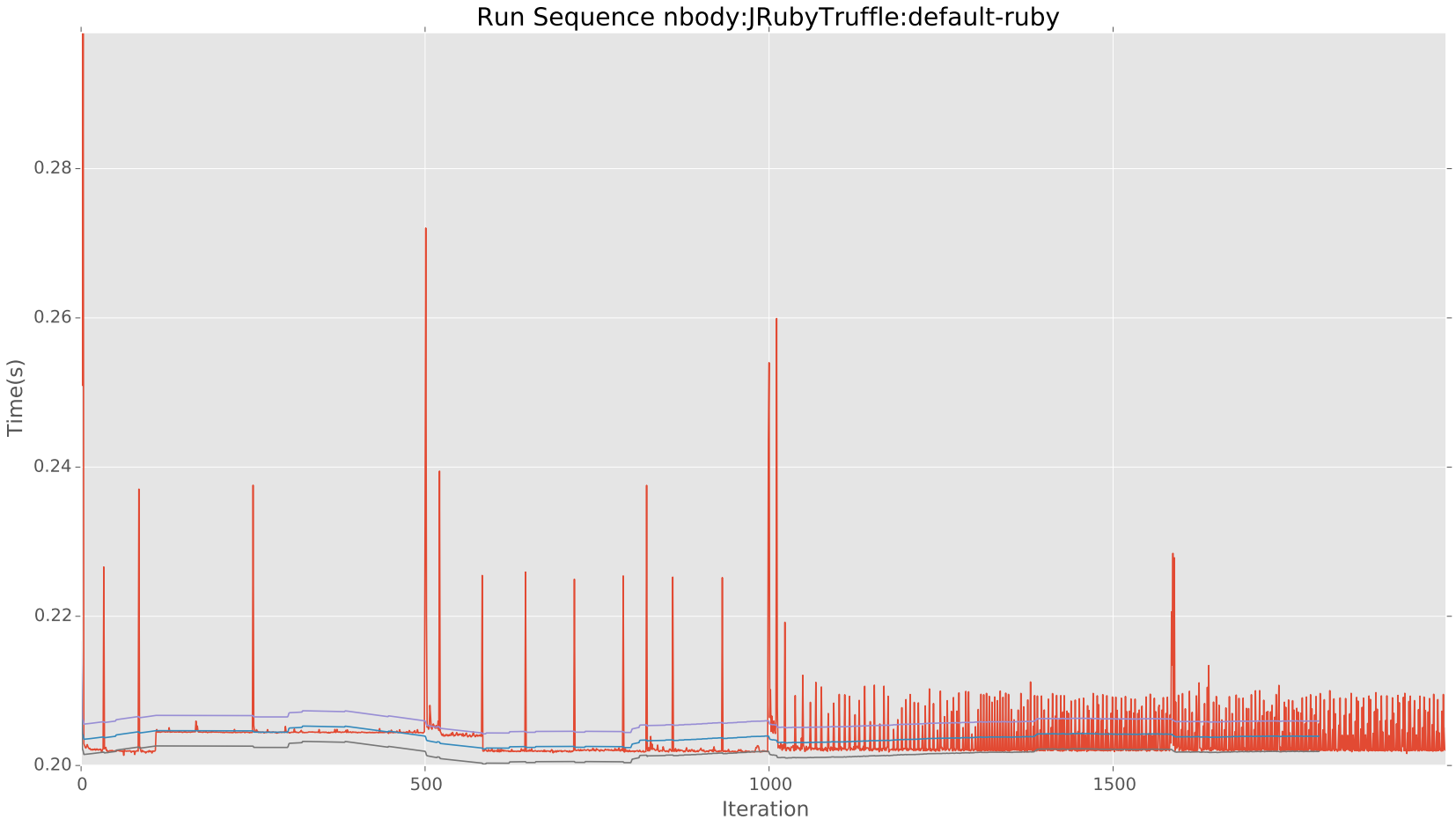
Late phase changes

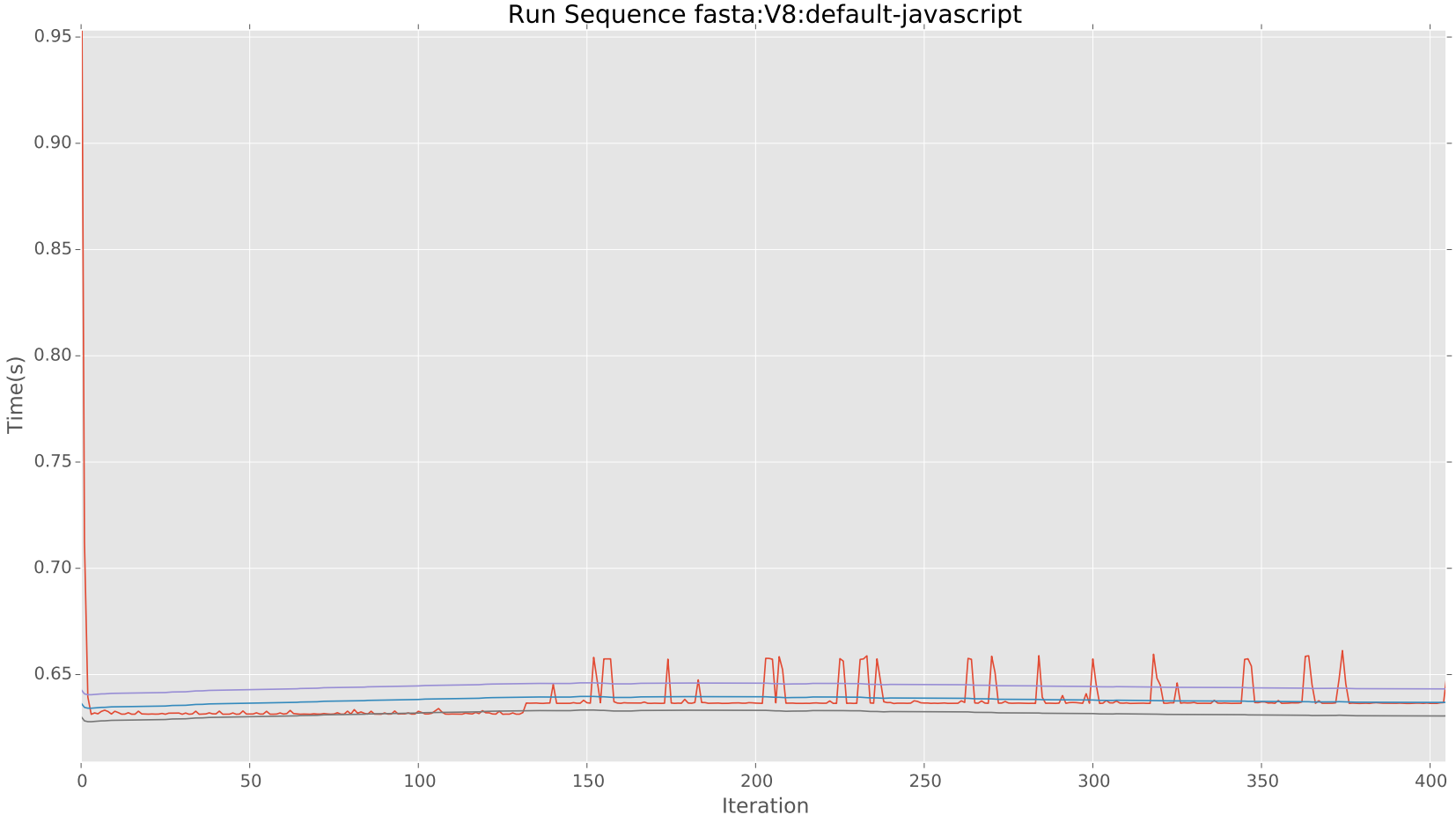

Run Sequence nbody:LuaJIT:default-lua
Time(s)
0.1970
0.1965
0.1960
0.1955
0
50
100
150
200
250
300
350
400
Iteration

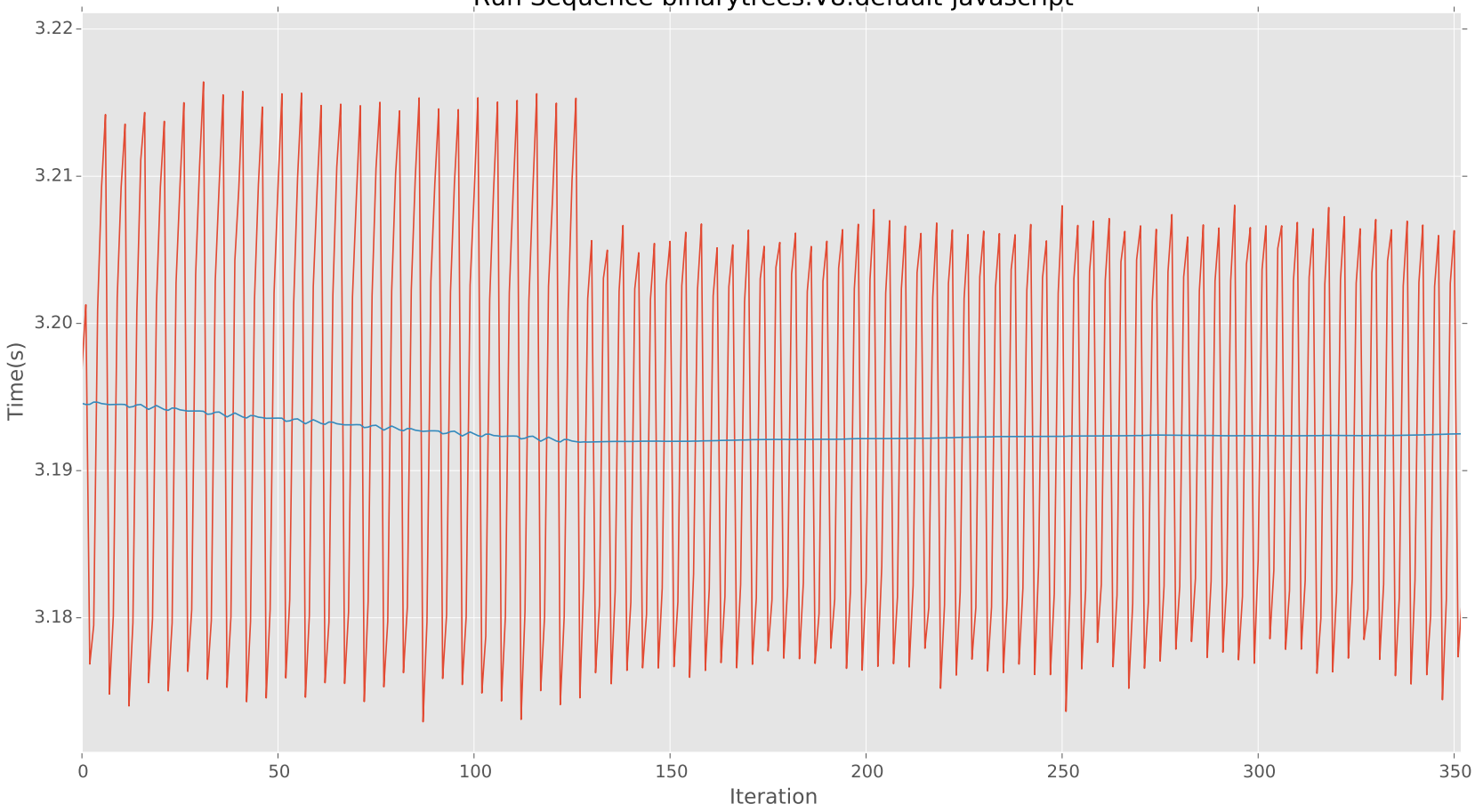

Run Sequence fasta:HHVM:default-php
Time(s)
0.74
0.73
0.72
0.71
0.70
0.69
0.68
0.67
0.66
0
100
200
300
400
Iteration

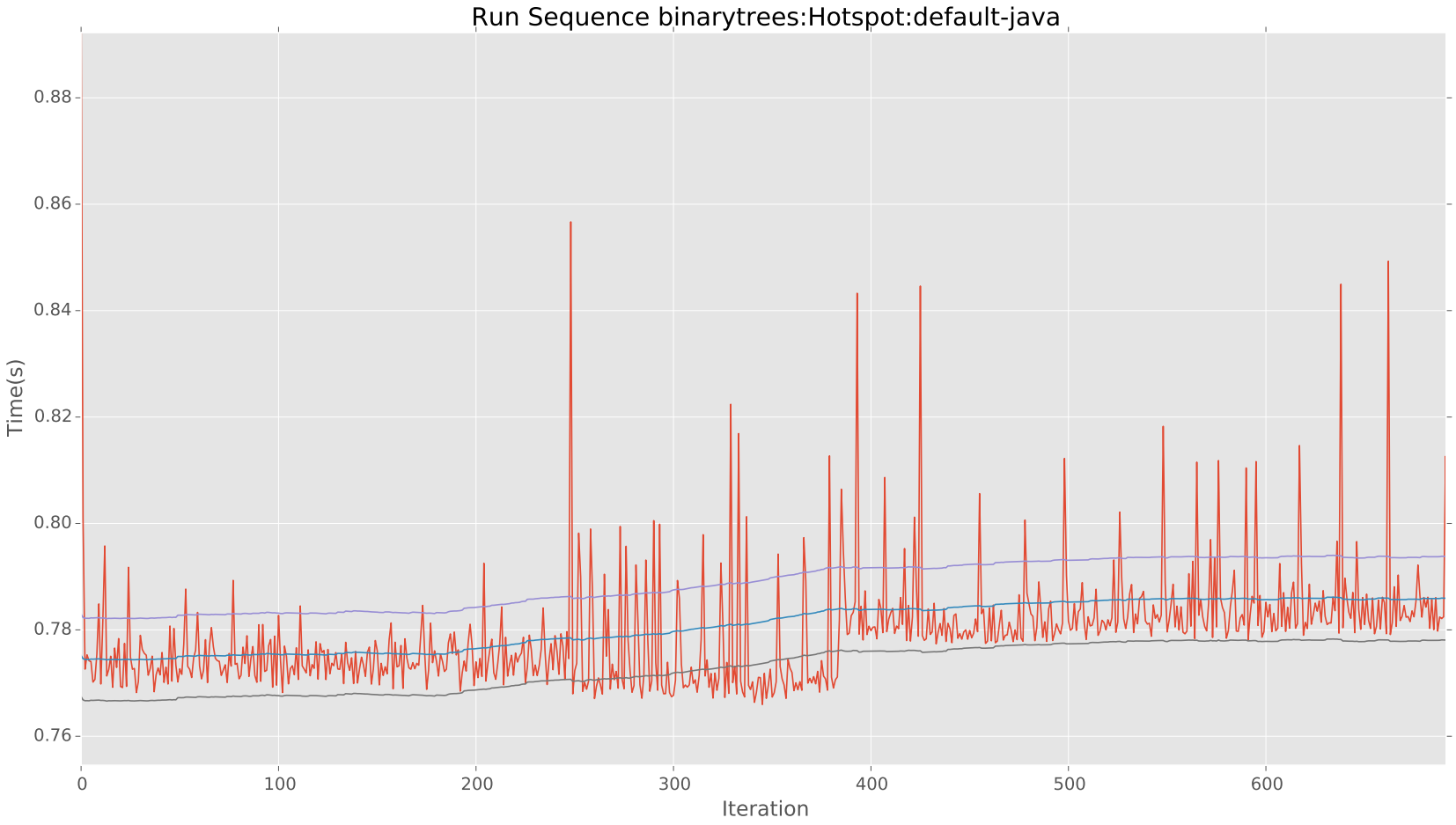

Run Sequence fannkuch_redux:HHVM:default-php
Time(s)
1.35
1.30
1.25
1.20
1.15
1.10
1.05
0
50
100
150
200
Iteration


Run Sequence spectralnorm:JRubyTruffle:default-ruby
Time(s)
3.8
3.7
3.6
3.5
3.4
3.3
3.2
3.1
3.0
0
500
1000
1500
Iteration


Run Sequence nbody:JRubyTruffle:default-ruby
Time(s)
0.28
0.26
0.24
0.22
0.20
0
500
1000
1500
Iteration


Run Sequence fasta:V8:default-javascript
Time(s)
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0
50
100
150
200
250
300
350
400
Iteration


Run Sequence binarytrees:V8:default-javascript
Time(s)
3.22
3.21
3.20
3.19
3.18
0
50
100
150
200
250
300
350
Iteration


Run Sequence binarytrees:Hotspot:default-java
Time(s)
0.88
0.86
0.84
0.82
0.80
0.78
0.76
0
100
200
300
400
500
600
Iteration

Now what?