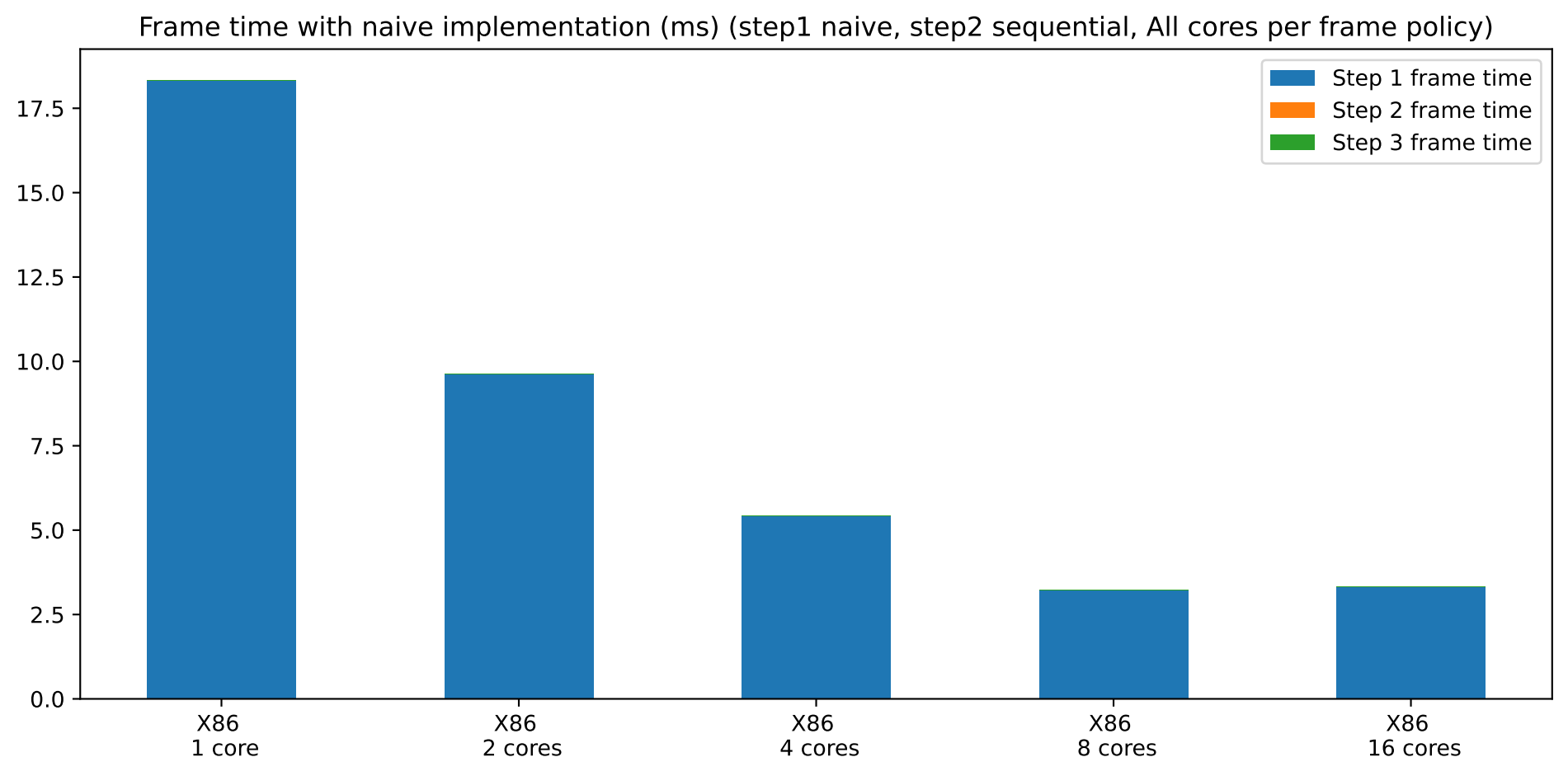
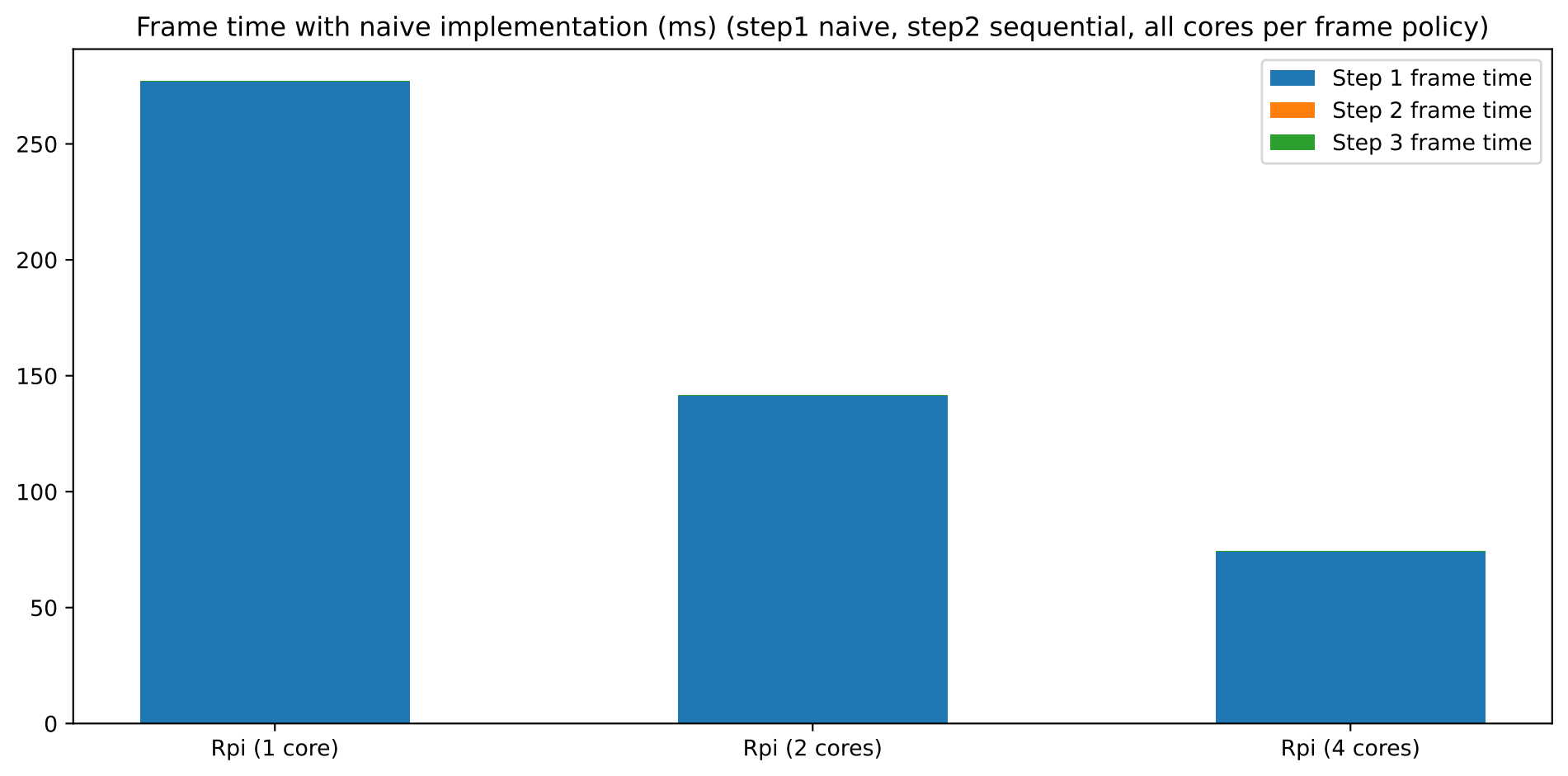
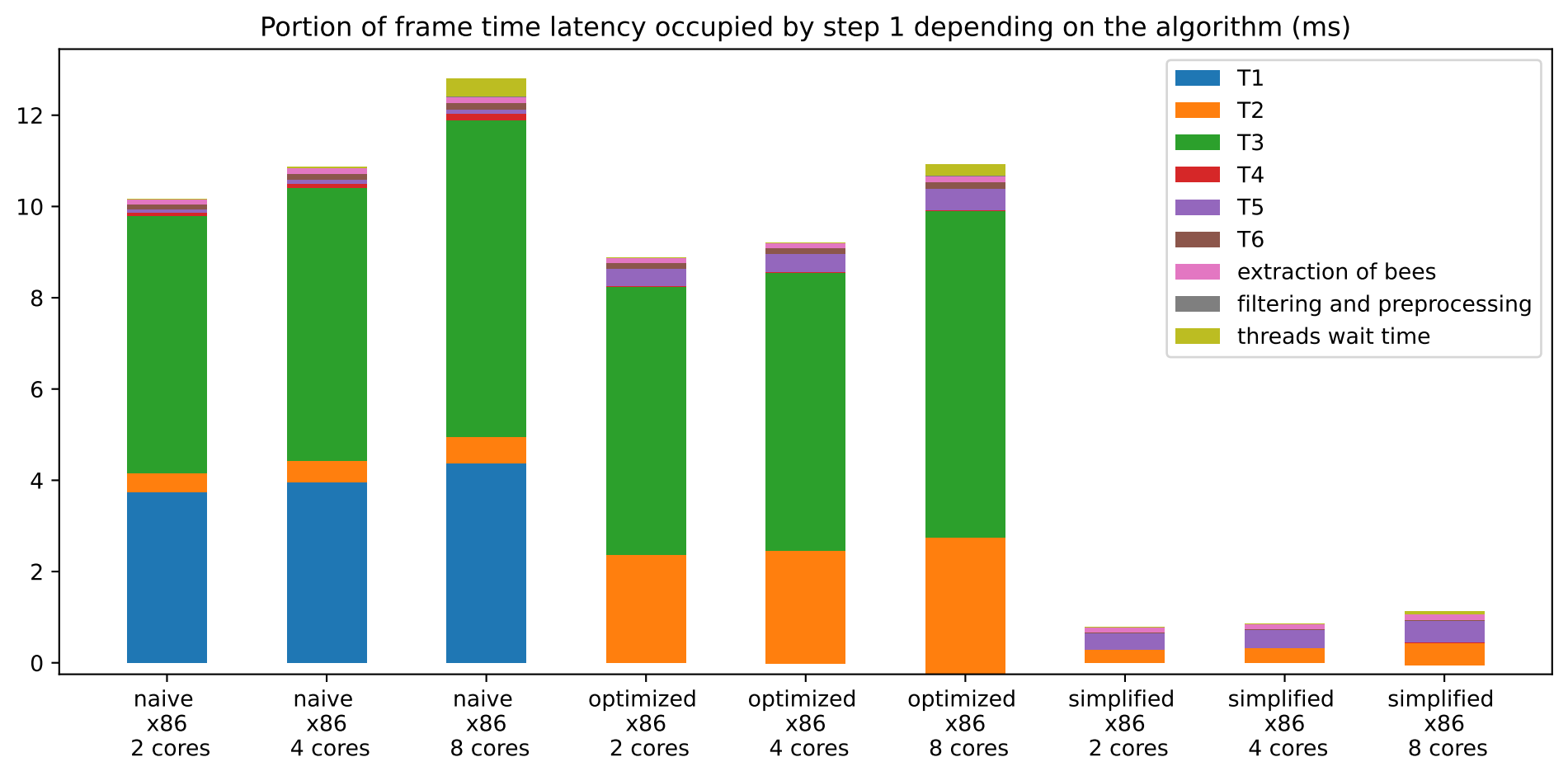
Results of x86 benchmarks on the following platform:
- Intel Core I7 11800H
8 cores
8x48KB L1D
8x1.25MB L2
24MB L3
- 32GB DDR4

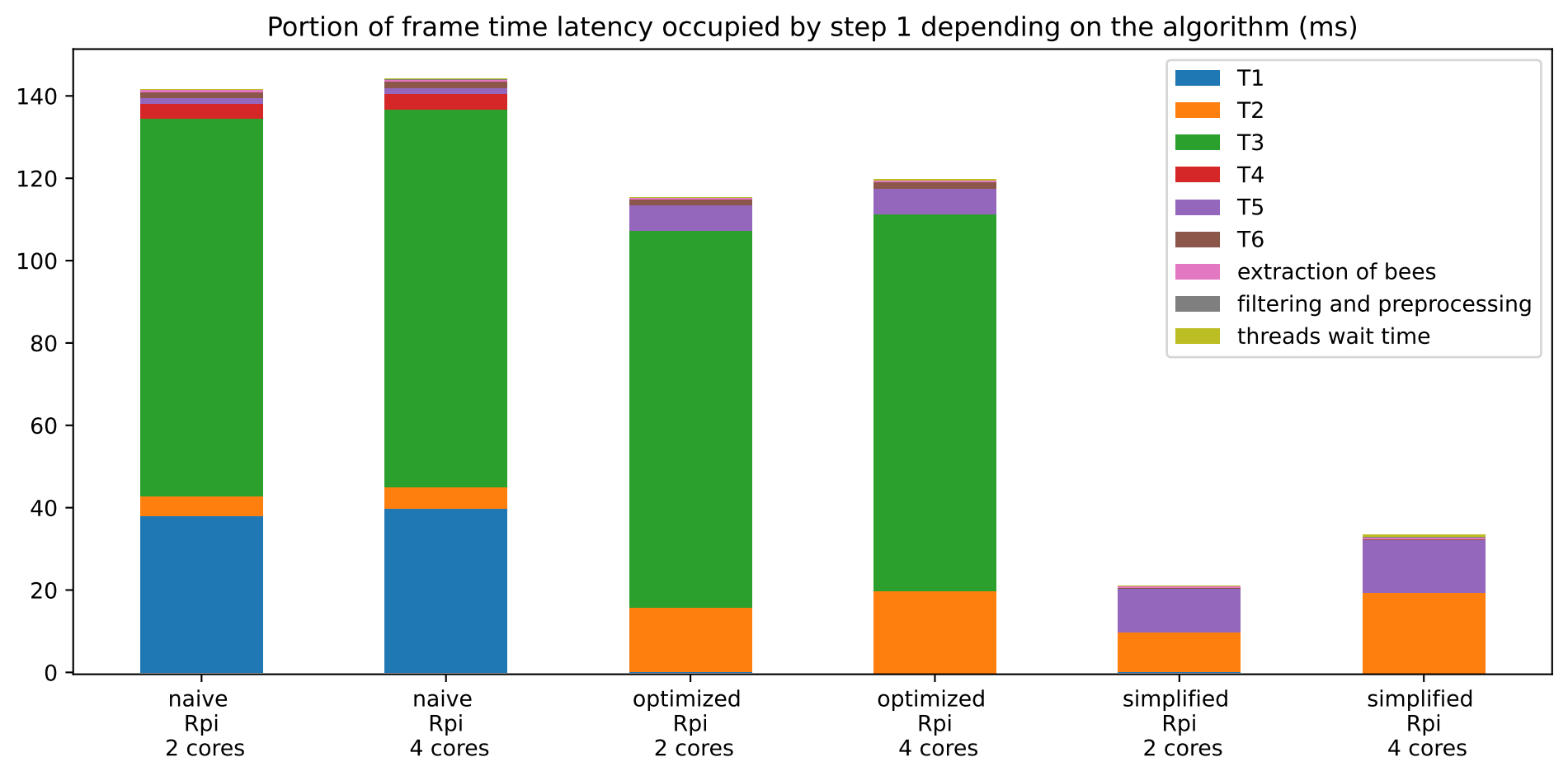
Results of Raspberry pi benchmarks on the following platform:
- Raspberry pi 3B
4 cores Cortex-A53
- 1GB DDR2

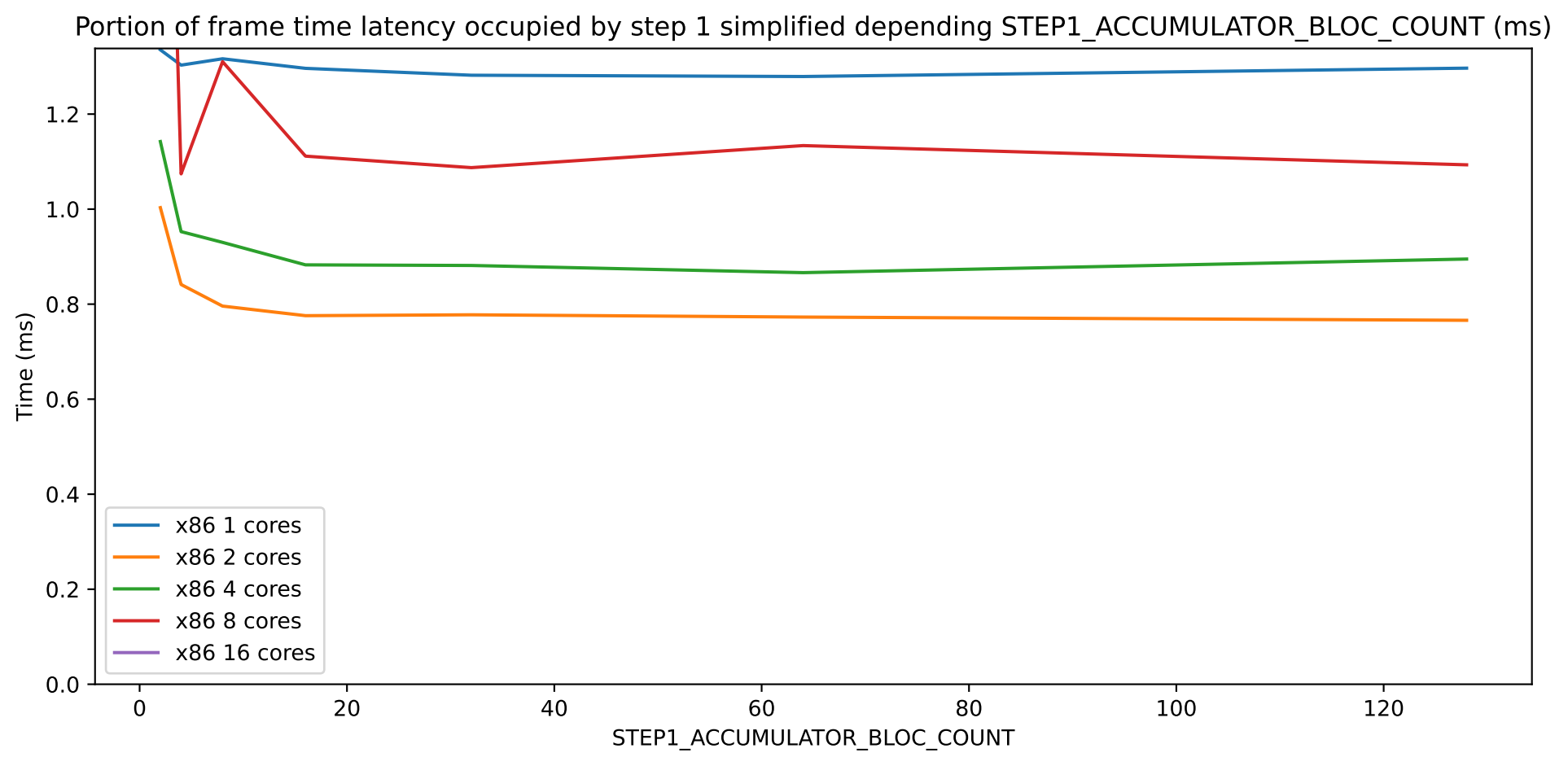
If not specified, the following default parameters are applied:
- input resolution: 1920*480
- STEP1_ACCUMULATOR_BLOC_COUNT = 16
- PATH_DETECTION_RADIUS = 150
- Scheduling policy = Hybrid

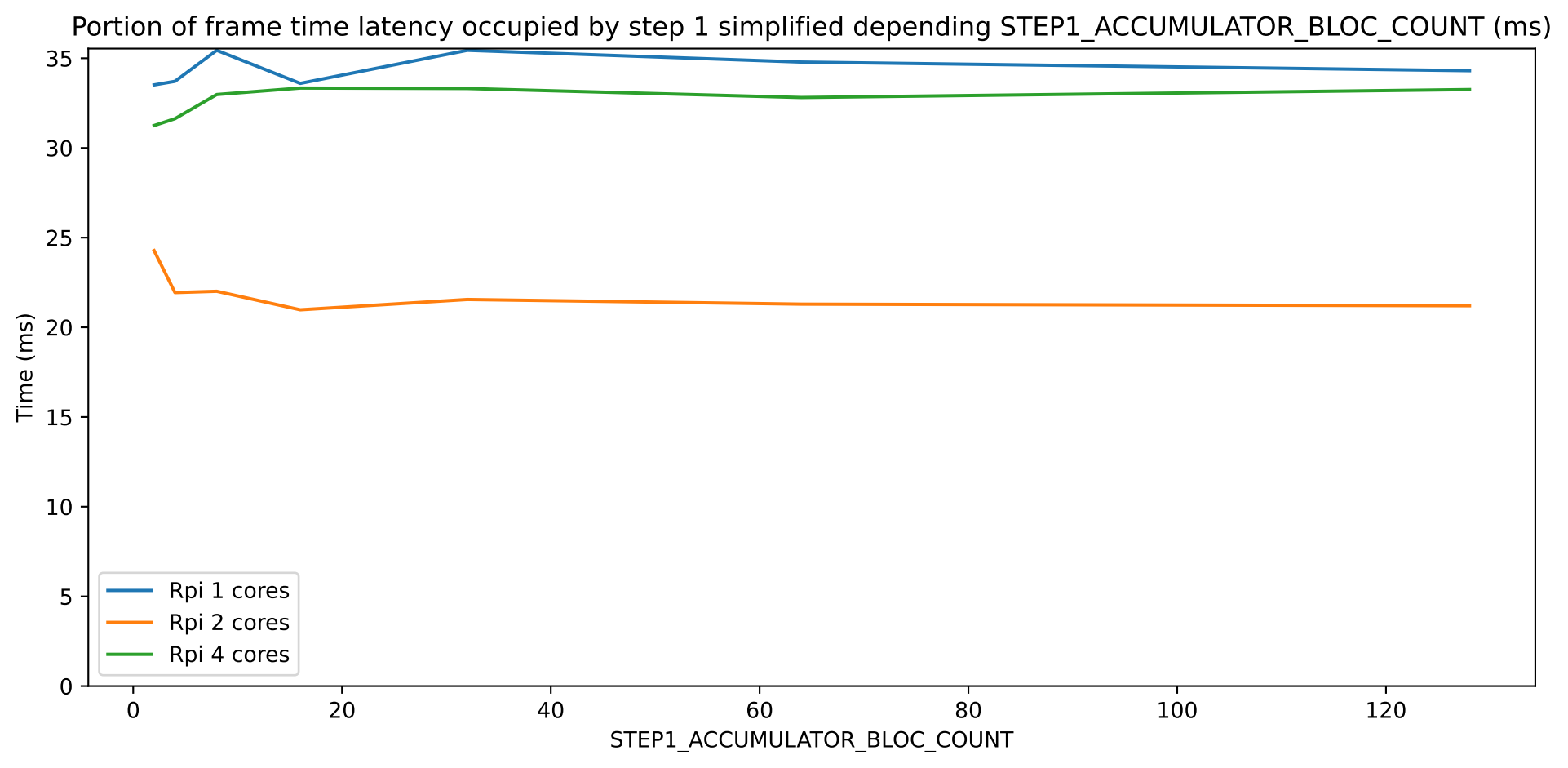

Frame time with naive implementation (ms) (step1 naive, step2 sequential, All cores per frame policy)
Step 1 frame time
Step 2 frame time
Step 3 frame time
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
X86
1 core
X86
2 cores
X86
4 cores
X86
8 cores
X86
16 cores

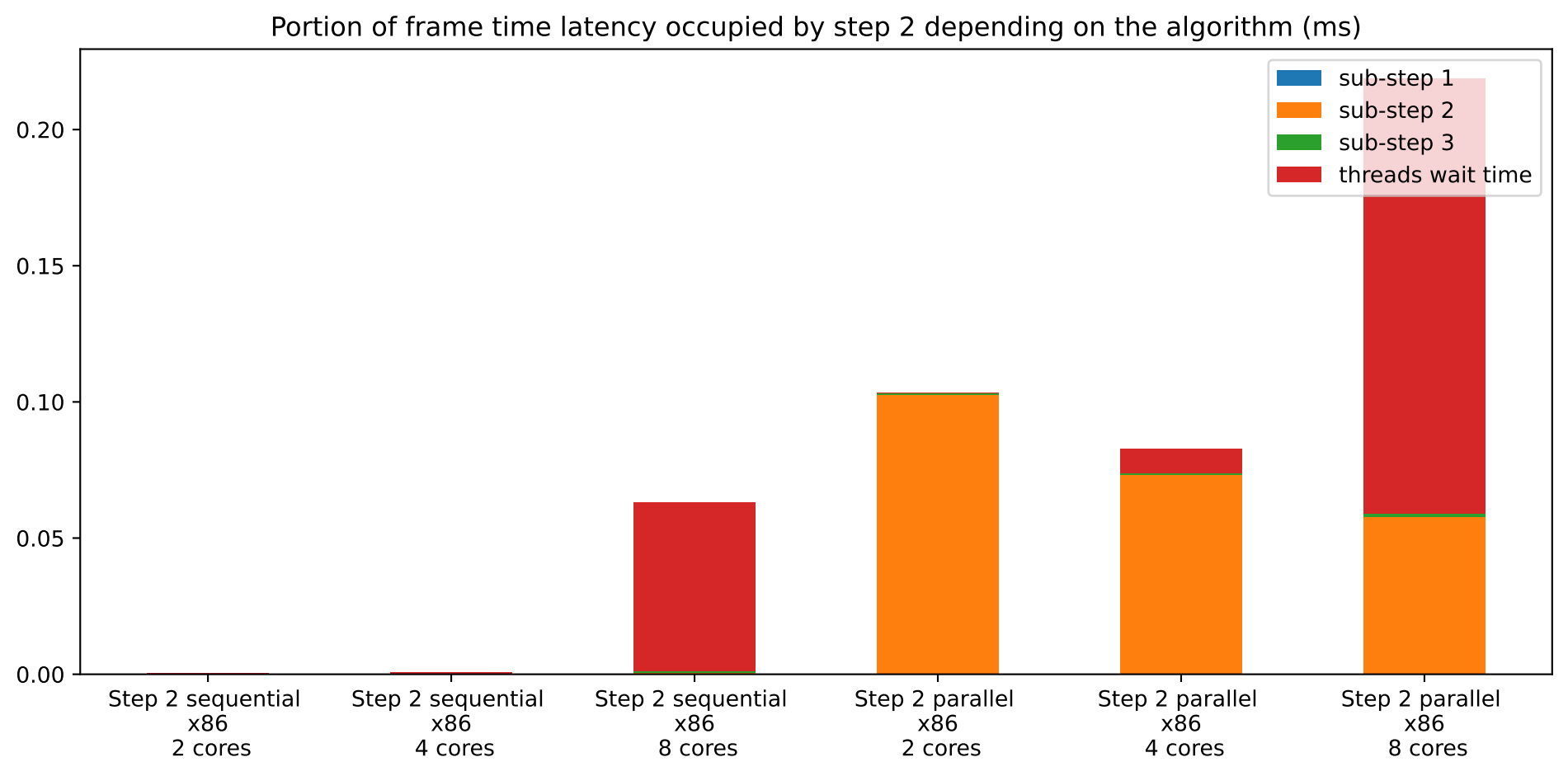

Frame time with naive implementation (ms) (step1 naive, step2 sequential, all cores per frame policy)
Step 1 frame time
Step 2 frame time
Step 3 frame time
250
200
150
100
50
0
Rpi (1 core)
Rpi (2 cores)
Rpi (4 cores)

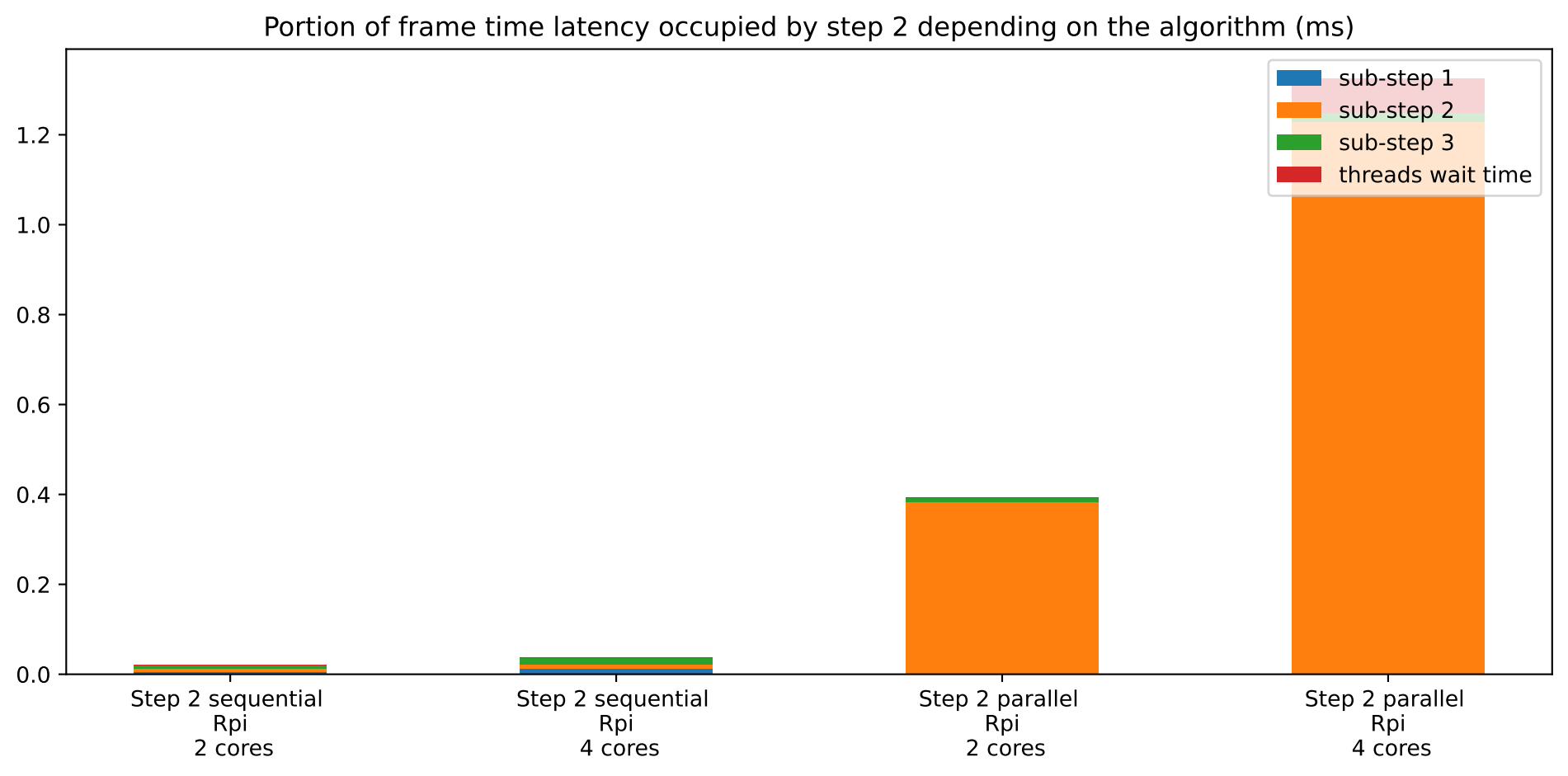

Portion of frame time latency occupied by step 1 depending on the algorithm (ms)
T1
T2
T3
T4
T5
T6
extraction of bees
filtering and preprocessing
threads wait time
0
2
4
6
8
10
12
naive x86 2 cores
naive x86 4 cores
naive x86 8 cores
optimized x86 2 cores
optimized x86 4 cores
optimized x86 8 cores
simplified x86 2 cores
simplified x86 4 cores
simplified x86 8 cores

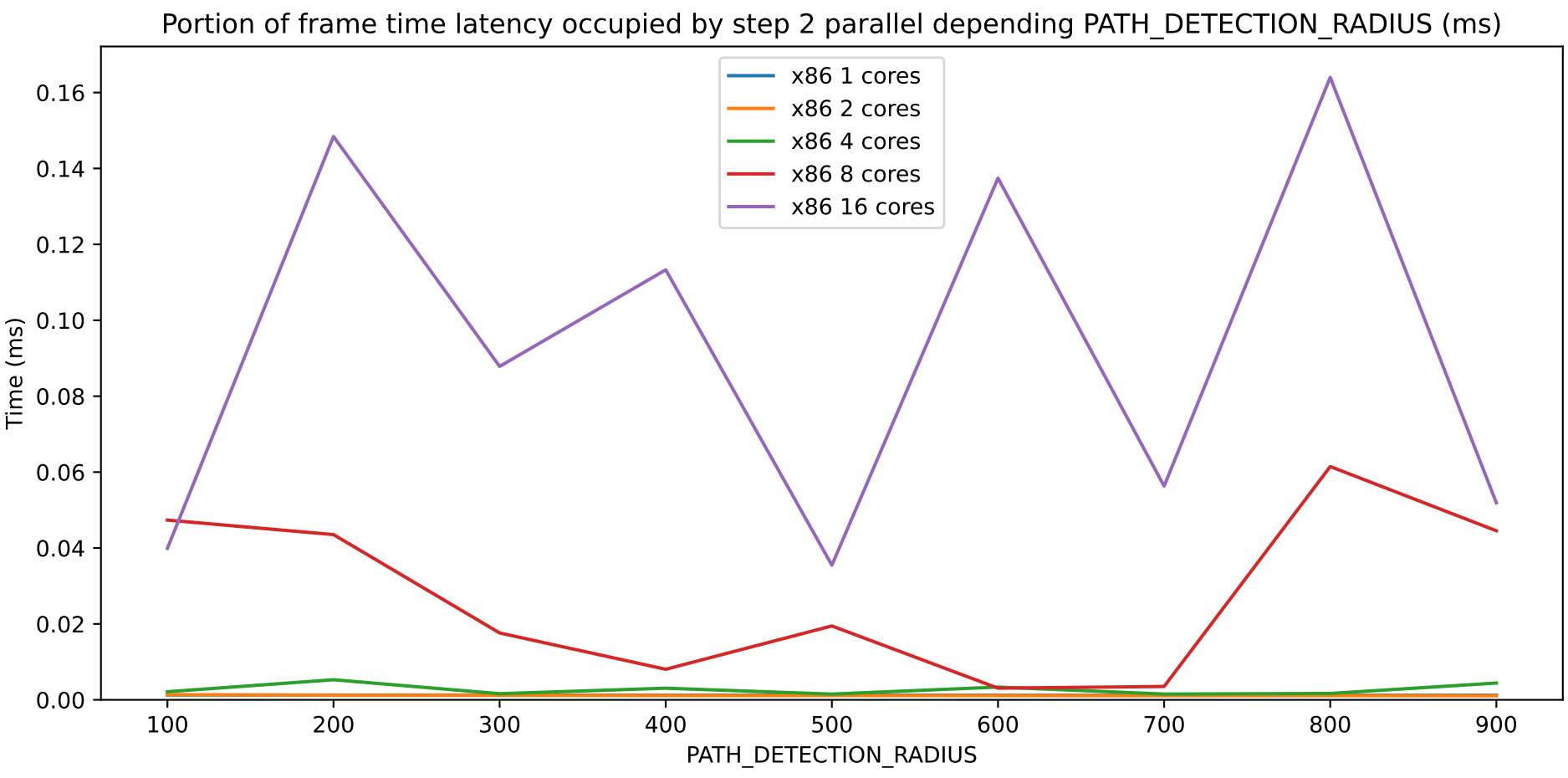

Portion of frame time latency occupied by step 1 depending on the algorithm (ms)
T1
T2
T3
T4
T5
T6
extraction of bees
filtering and preprocessing
threads wait time
0
20
40
60
80
100
120
140
naive Rpi 2 cores
naive Rpi 4 cores
optimized Rpi 2 cores
optimized Rpi 4 cores
simplified Rpi 2 cores
simplified Rpi 4 cores

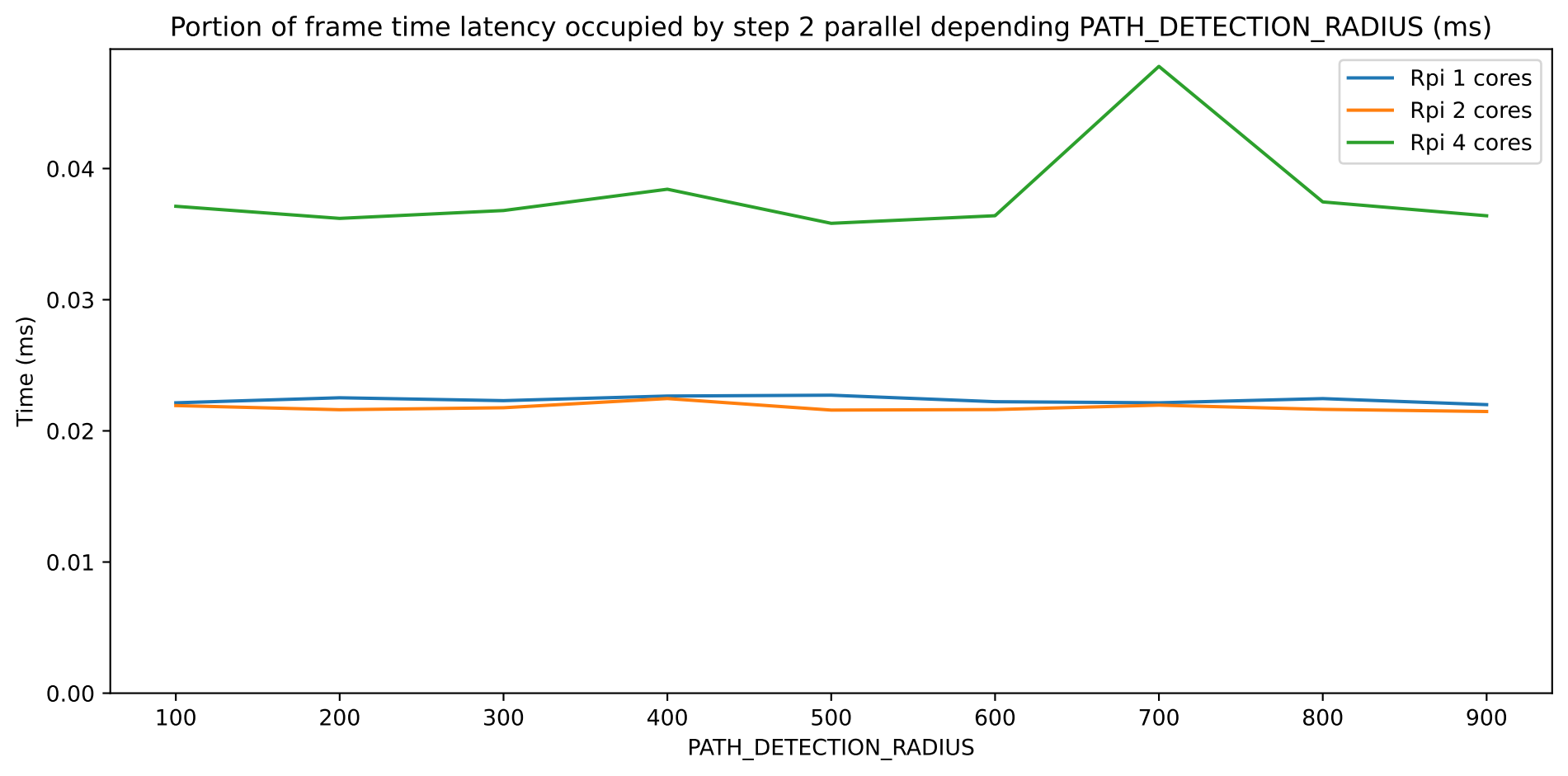

Portion of frame time latency occupied by step 1 simplified depending STEP1_ACCUMULATOR_BLOC_COUNT (ms)
Time (ms)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0
20
40
60
80
100
120
STEP1_ACCUMULATOR_BLOC_COUNT
x86 1 cores
x86 2 cores
x86 4 cores
x86 8 cores
x86 16 cores

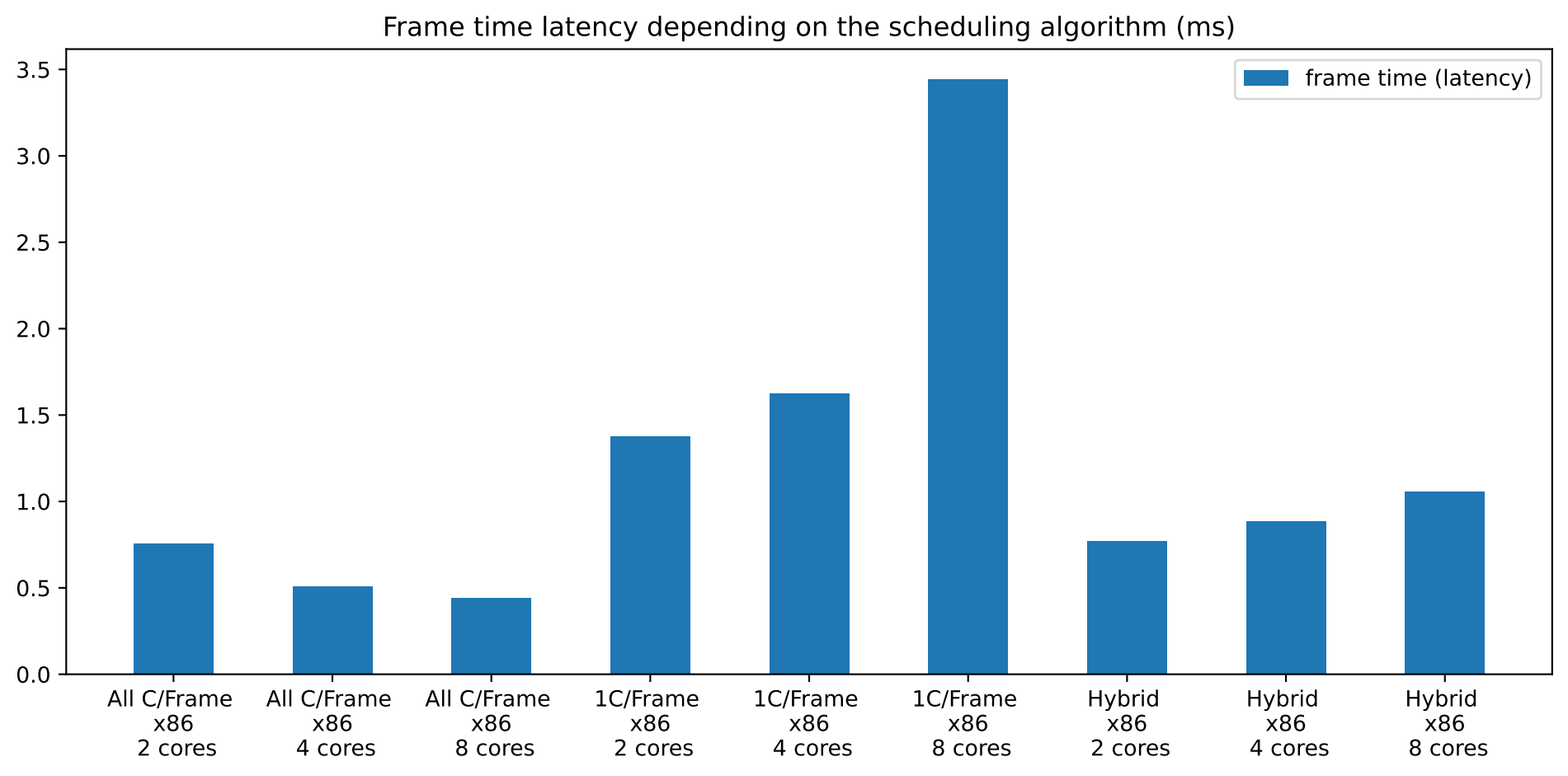

Portion of frame time latency occupied by step 1 simplified depending STEP1_ACCUMULATOR_BLOC_COUNT (ms)
Time (ms)
STEP1_ACCUMULATOR_BLOC_COUNT
Rpi 1 cores
Rpi 2 cores
Rpi 4 cores
0
5
10
15
20
25
30
35
0
20
40
60
80
100
120

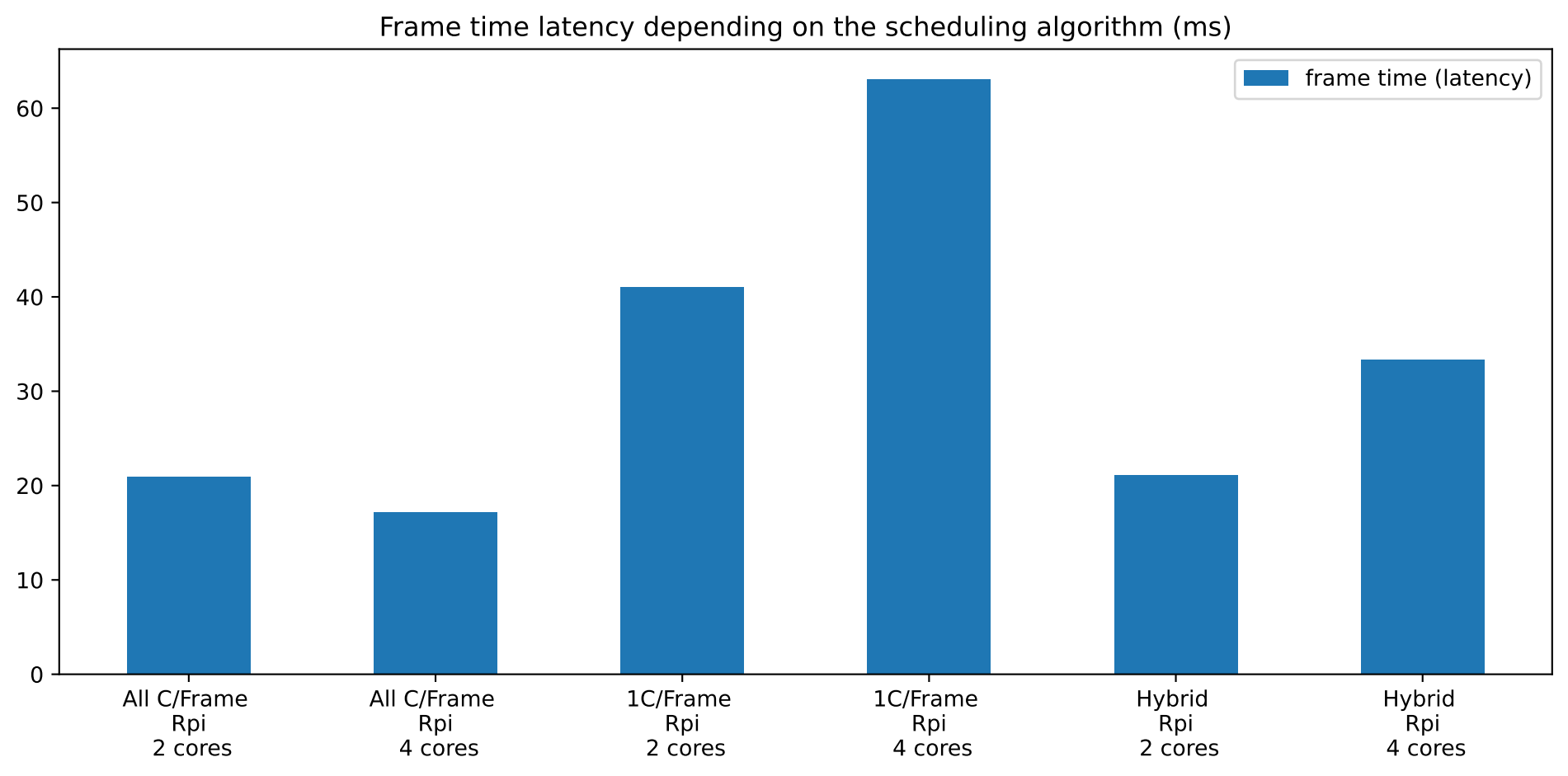

Portion of frame time latency occupied by step 2 depending on the algorithm (ms)
sub-step 1
sub-step 2
sub-step 3
threads wait time
0.20
0.15
0.10
0.05
0.00
Step 2 sequential x86 2 cores
Step 2 sequential x86 4 cores
Step 2 sequential x86 8 cores
Step 2 parallel x86 2 cores
Step 2 parallel x86 4 cores
Step 2 parallel x86 8 cores

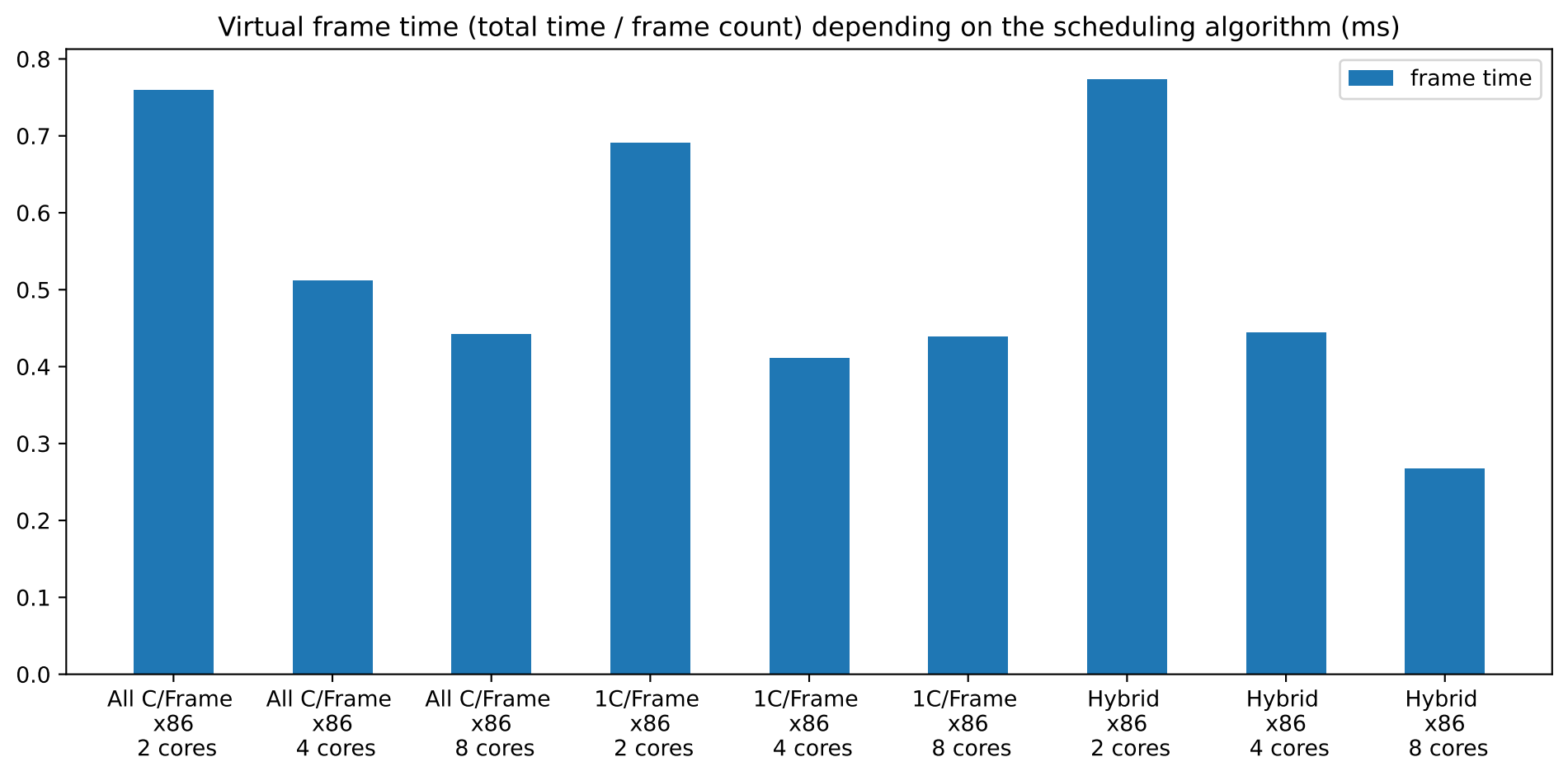

Portion of frame time latency occupied by step 2 depending on the algorithm (ms)
sub-step 1
sub-step 2
sub-step 3
threads wait time
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Step 2 sequential
Rpi
2 cores
Step 2 sequential
Rpi
4 cores
Step 2 parallel
Rpi
2 cores
Step 2 parallel
Rpi
4 cores

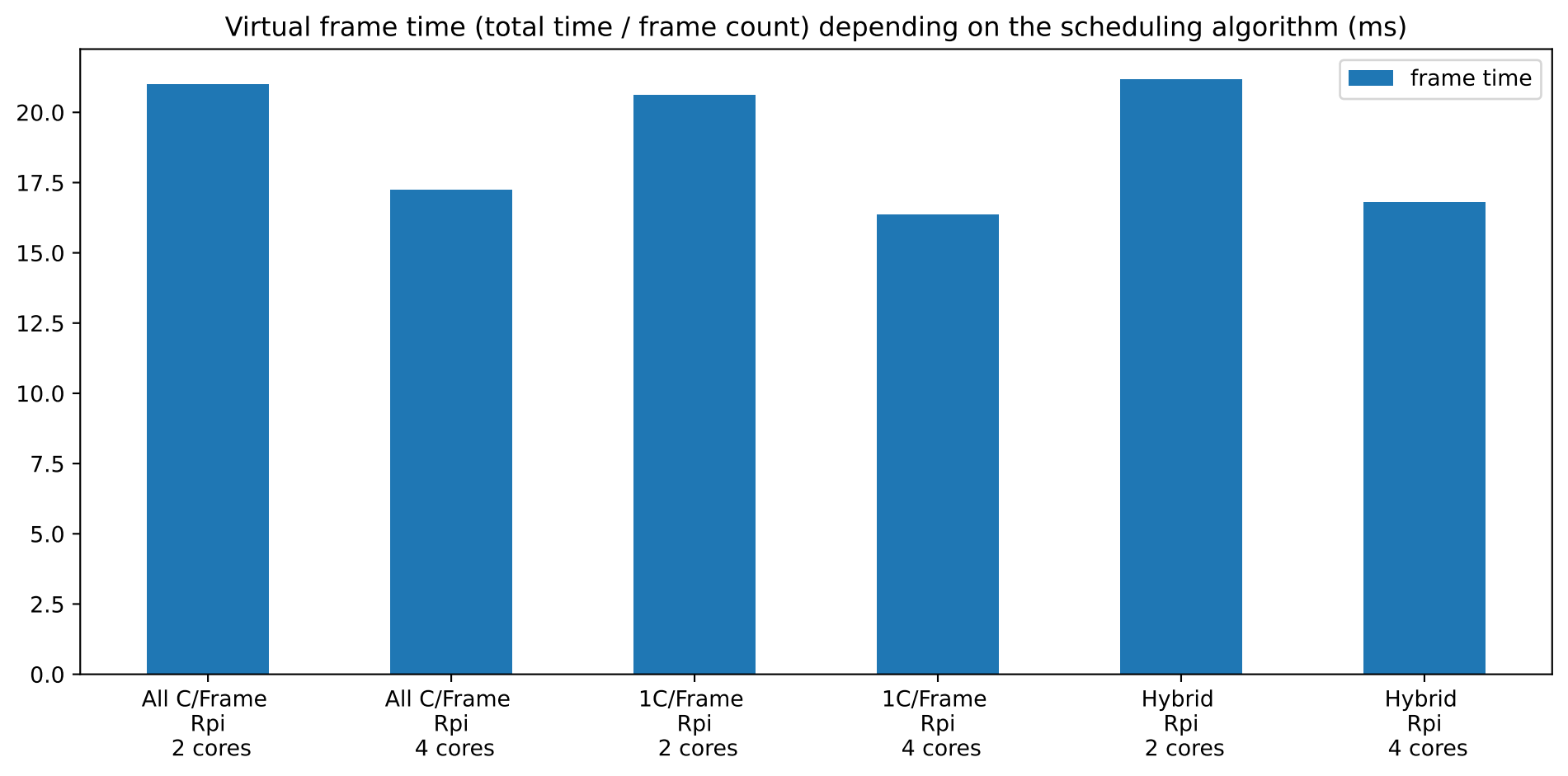

Portion of frame time latency occupied by step 2 parallel depending PATH_DETECTION_RADIUS (ms)
x86 1 cores
x86 2 cores
x86 4 cores
x86 8 cores
x86 16 cores
Time (ms)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
100
200
300
400
500
600
700
800
900
PATH_DETECTION_RADIUS

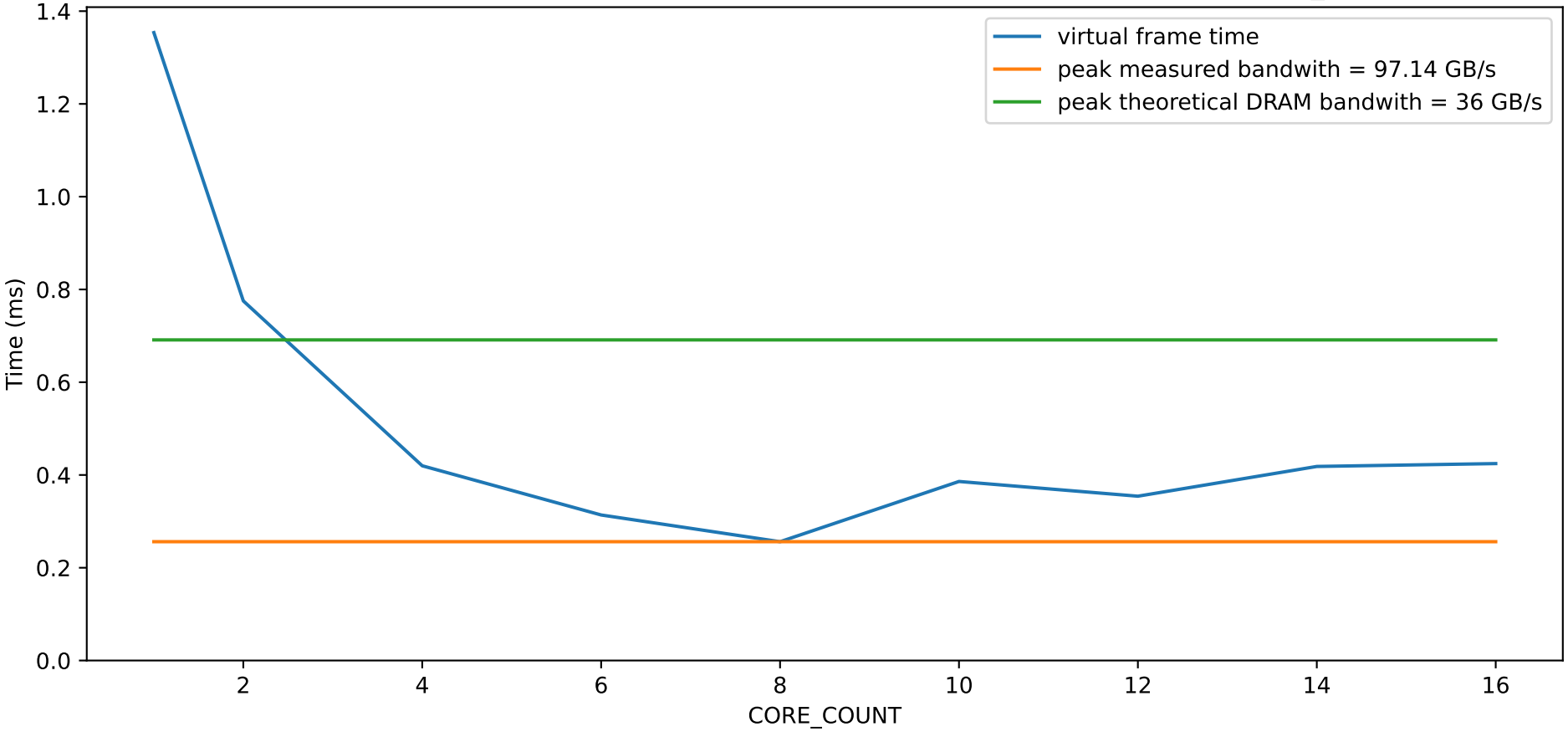

Portion of frame time latency occupied by step 2 parallel depending PATH_DETECTION_RADIUS (ms)
Rpi 1 cores
Rpi 2 cores
Rpi 4 cores
Time (ms)
0.00
0.01
0.02
0.03
0.04
100
200
300
400
500
600
700
800
900
PATH_DETECTION_RADIUS

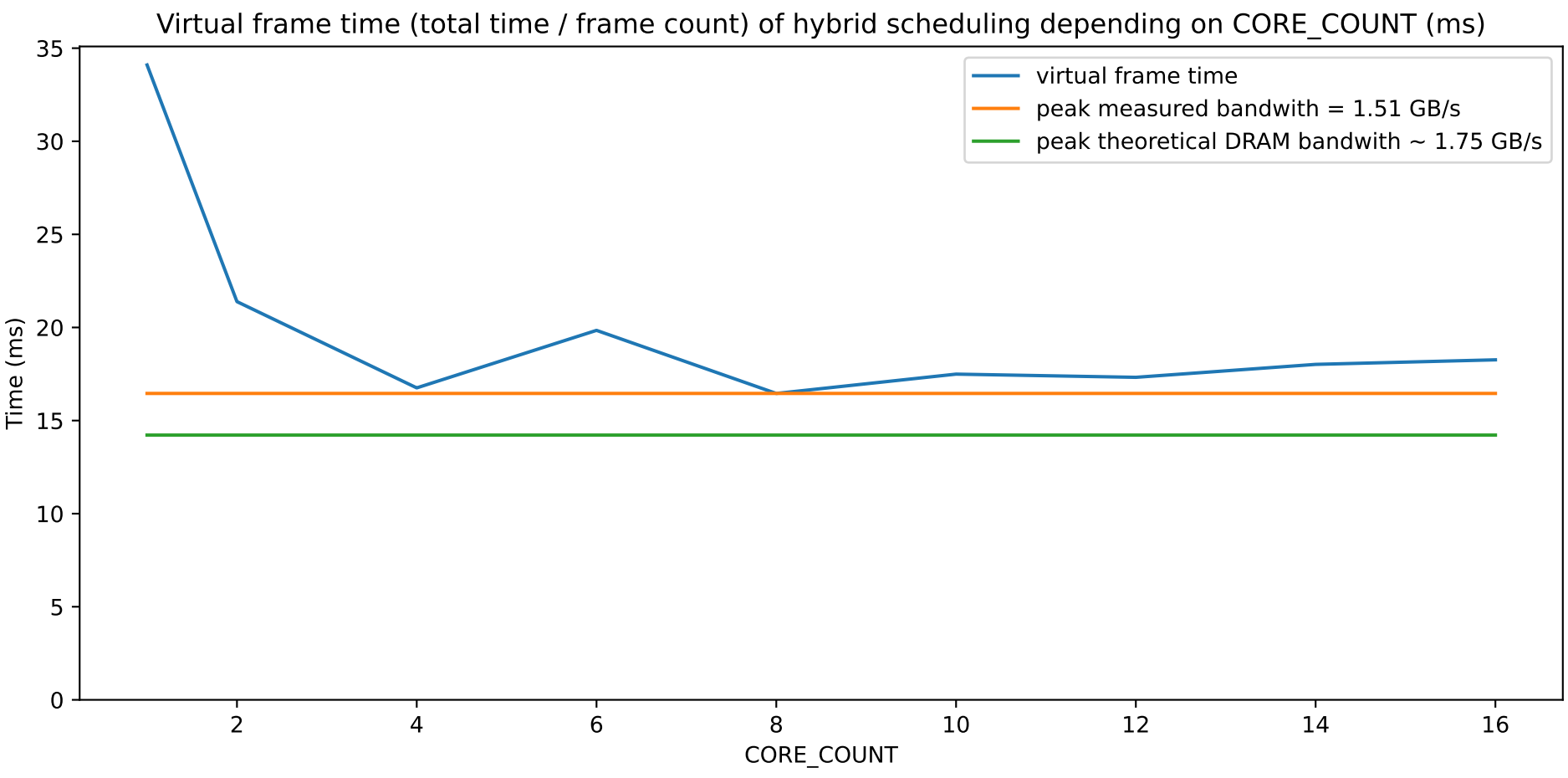

Frame time latency depending on the scheduling algorithm (ms)
frame time (latency)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
All C/Frame x86 2 cores
All C/Frame x86 4 cores
All C/Frame x86 8 cores
1C/Frame x86 2 cores
1C/Frame x86 4 cores
1C/Frame x86 8 cores
Hybrid x86 2 cores
Hybrid x86 4 cores
Hybrid x86 8 cores

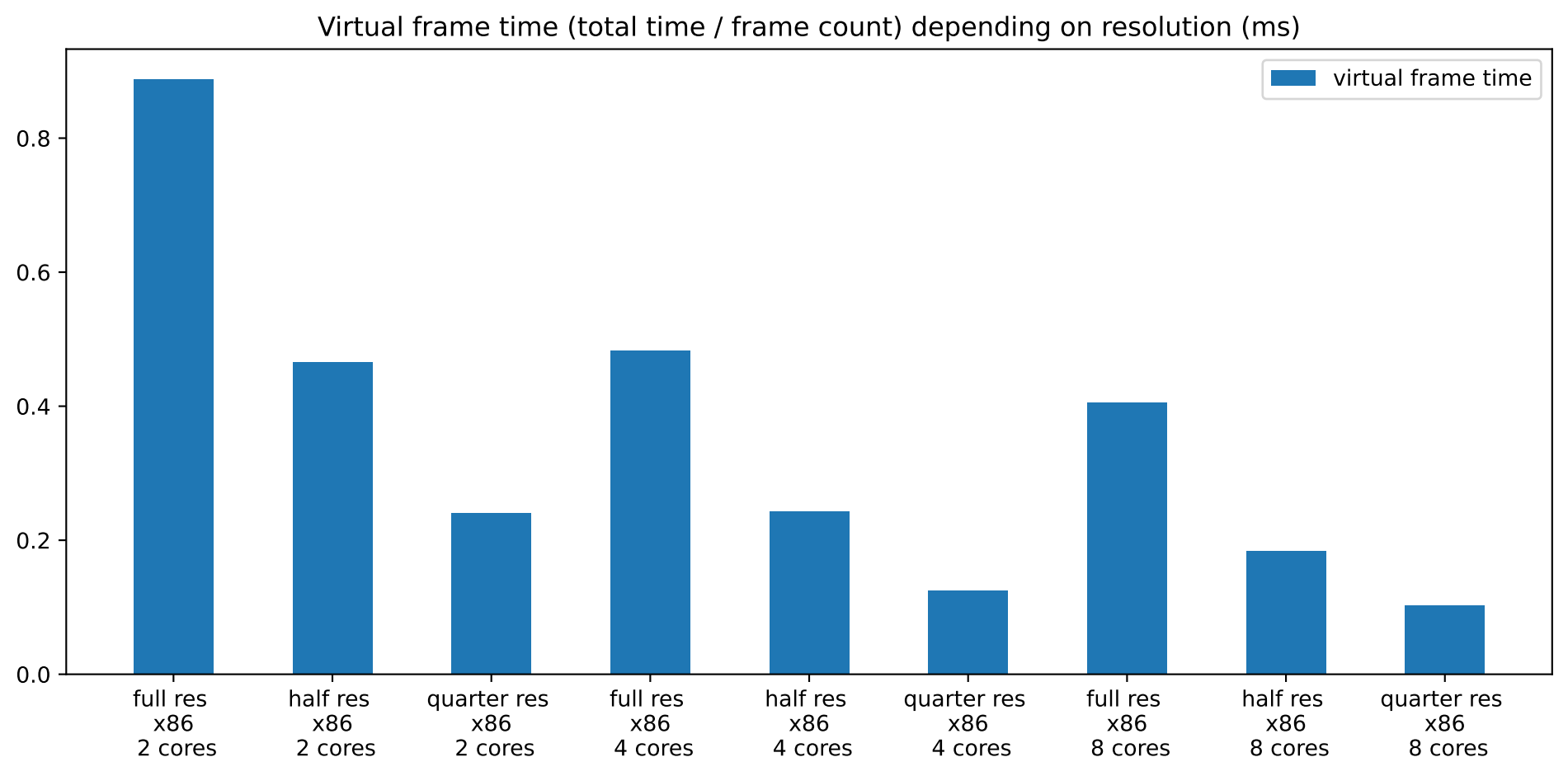

Frame time latency depending on the scheduling algorithm (ms)
frame time (latency)
0
10
20
30
40
50
60
All C/Frame
Rpi
2 cores
All C/Frame
Rpi
4 cores
1C/Frame
Rpi
2 cores
1C/Frame
Rpi
4 cores
Hybrid
Rpi
2 cores
Hybrid
Rpi
4 cores

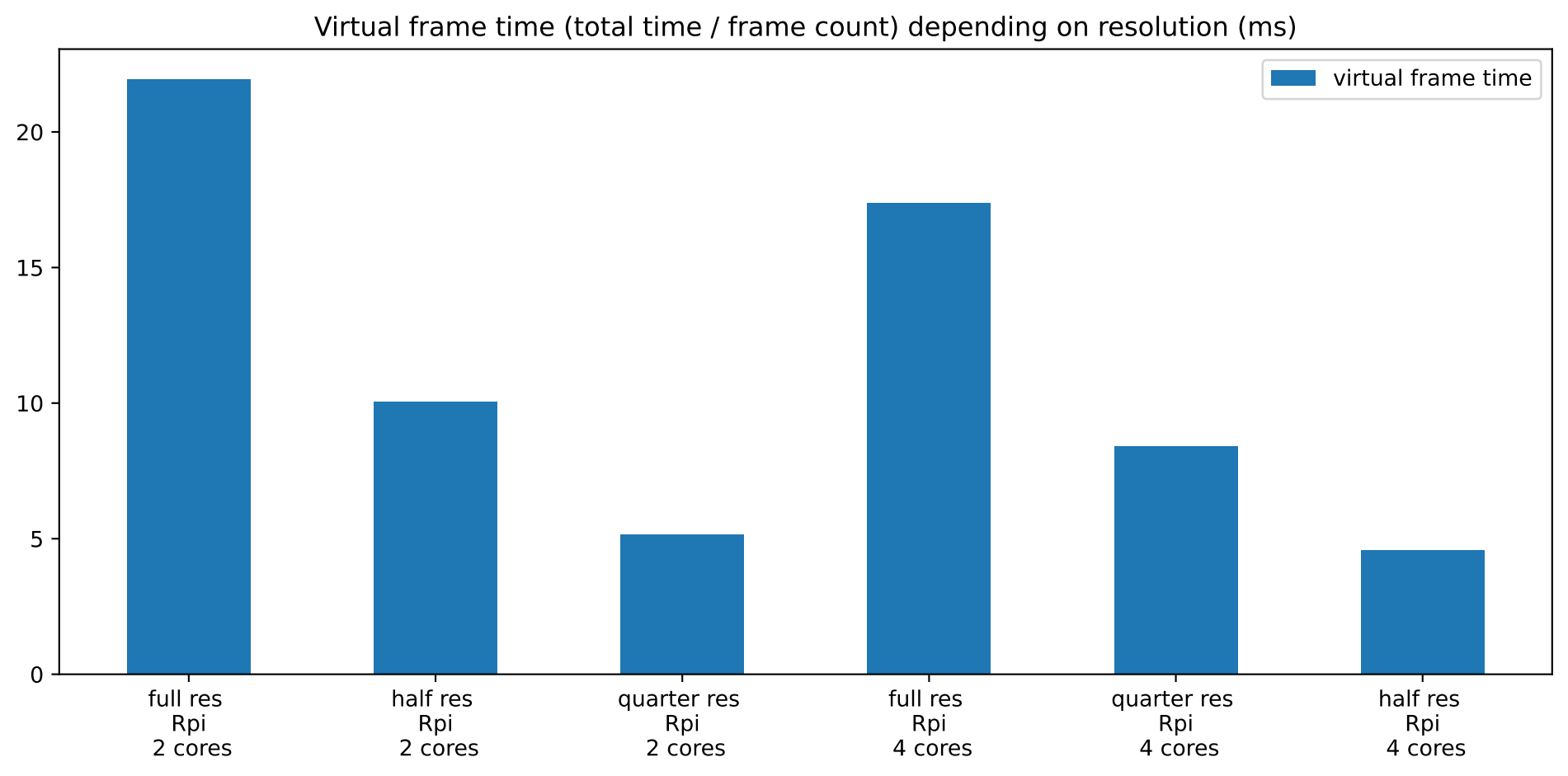

Virtual frame time (total time / frame count) depending on the scheduling algorithm (ms)
frame time
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
All C/Frame x86 2 cores
All C/Frame x86 4 cores
All C/Frame x86 8 cores
1C/Frame x86 2 cores
1C/Frame x86 4 cores
1C/Frame x86 8 cores
Hybrid x86 2 cores
Hybrid x86 4 cores
Hybrid x86 8 cores

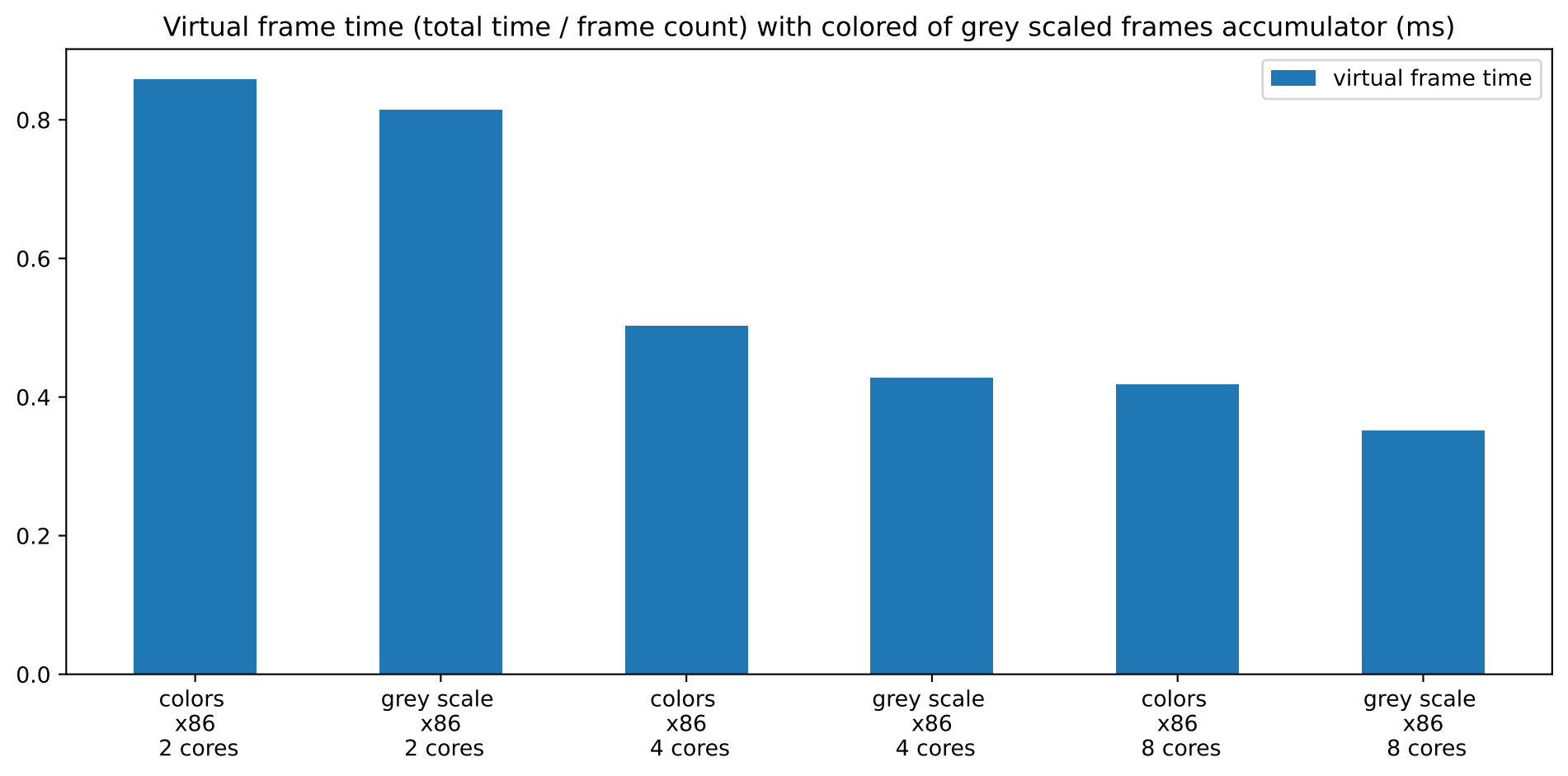

Virtual frame time (total time / frame count) depending on the scheduling algorithm (ms)
frame time
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
All C/Frame
Rpi
2 cores
All C/Frame
Rpi
4 cores
1C/Frame
Rpi
2 cores
1C/Frame
Rpi
4 cores
Hybrid
Rpi
2 cores
Hybrid
Rpi
4 cores

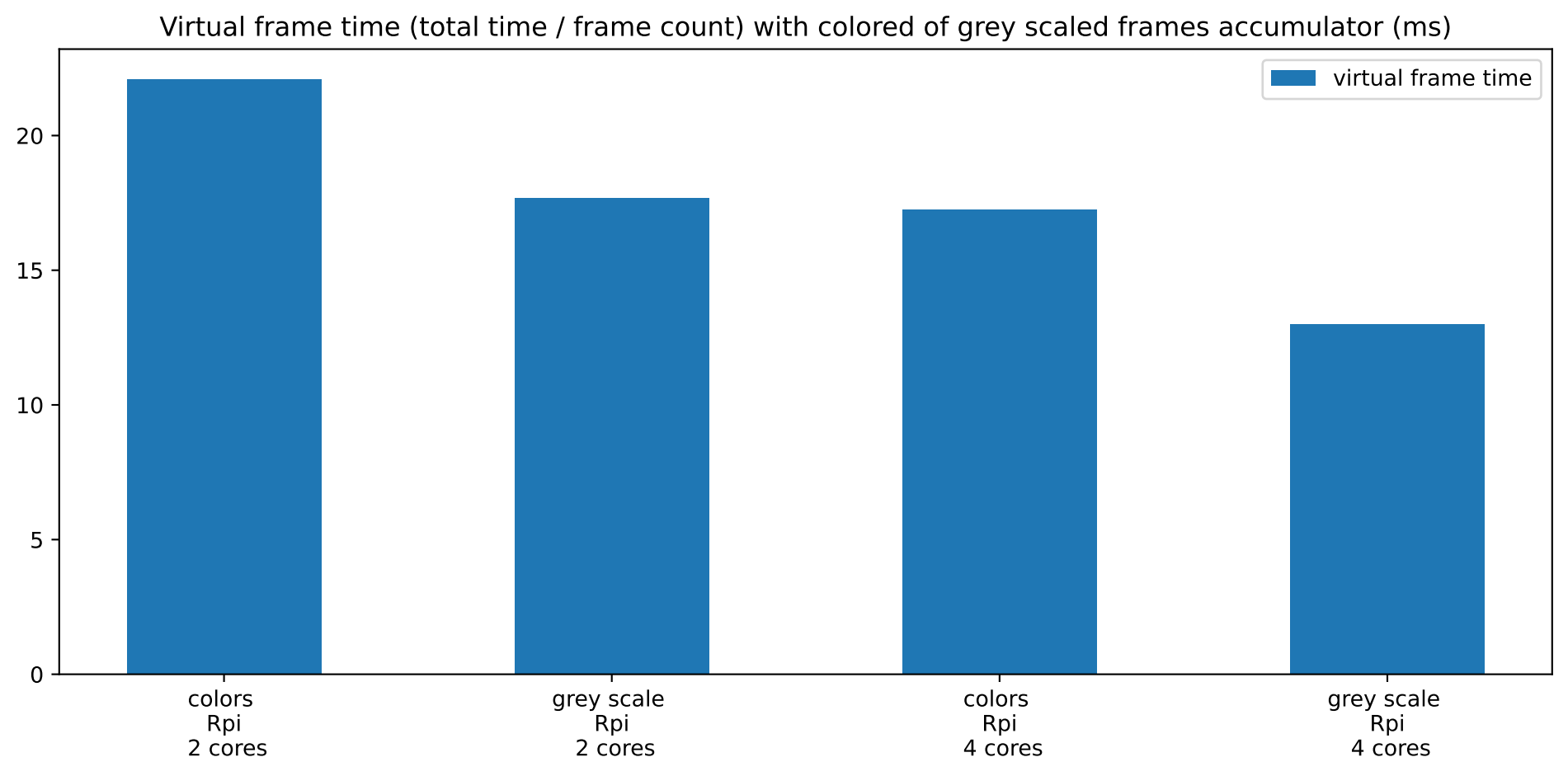

Virtual frame time (total time / frame count) of hybrid scheduling depending on CORE_COUNT (ms)
virtual frame time
peak measured bandwith = 97.14 GB/s
peak theoretical DRAM bandwith = 36 GB/s
Time (ms)
CORE_COUNT
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
2
4
6
8
10
12
14
16

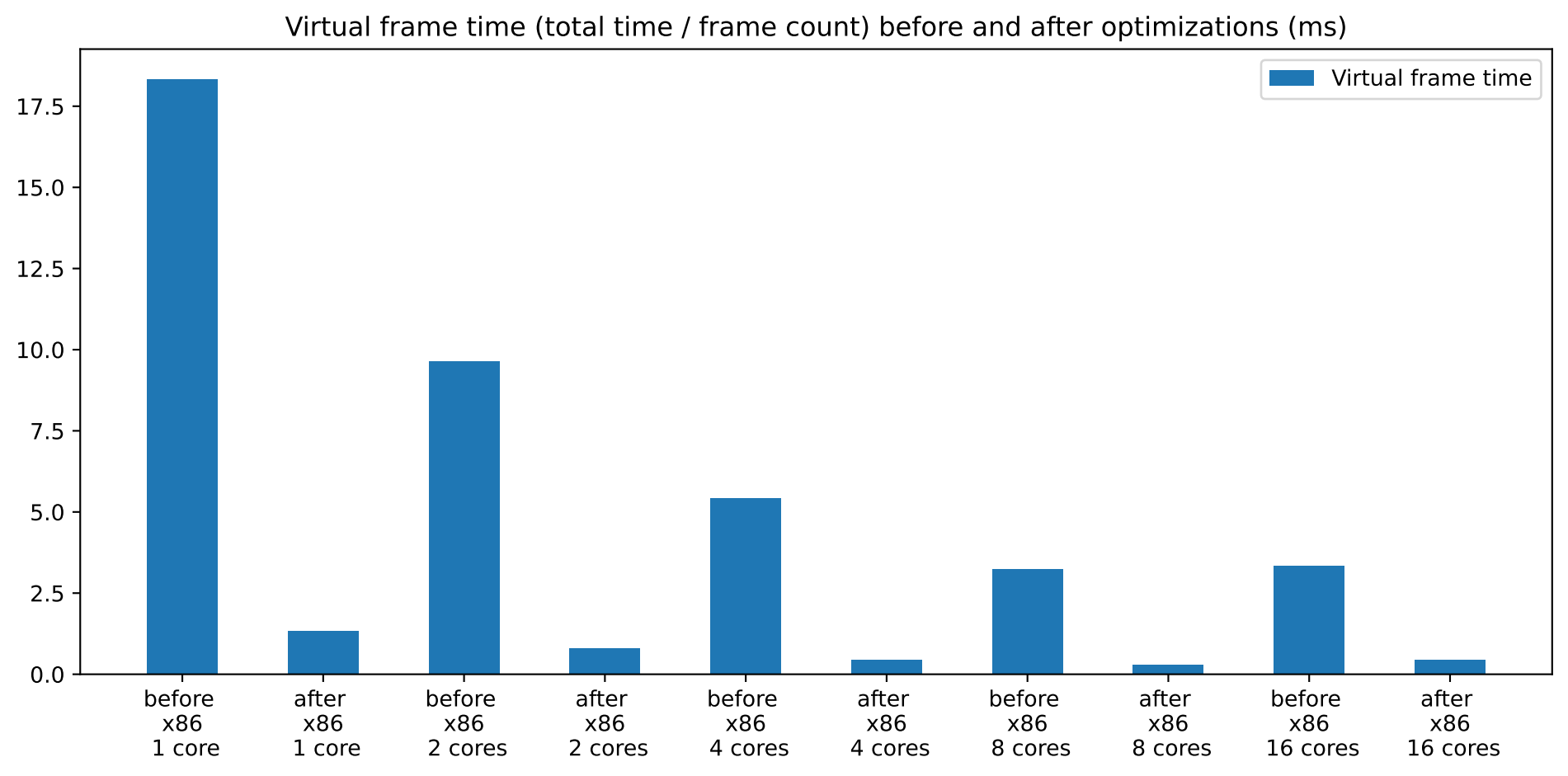

Virtual frame time (total time / frame count) of hybrid scheduling depending on CORE_COUNT (ms)
virtual frame time
peak measured bandwith = 1.51 GB/s
peak theoretical DRAM bandwith ~ 1.75 GB/s
Time (ms)
CORE_COUNT
0
5
10
15
20
25
30
35
2
4
6
8
10
12
14
16

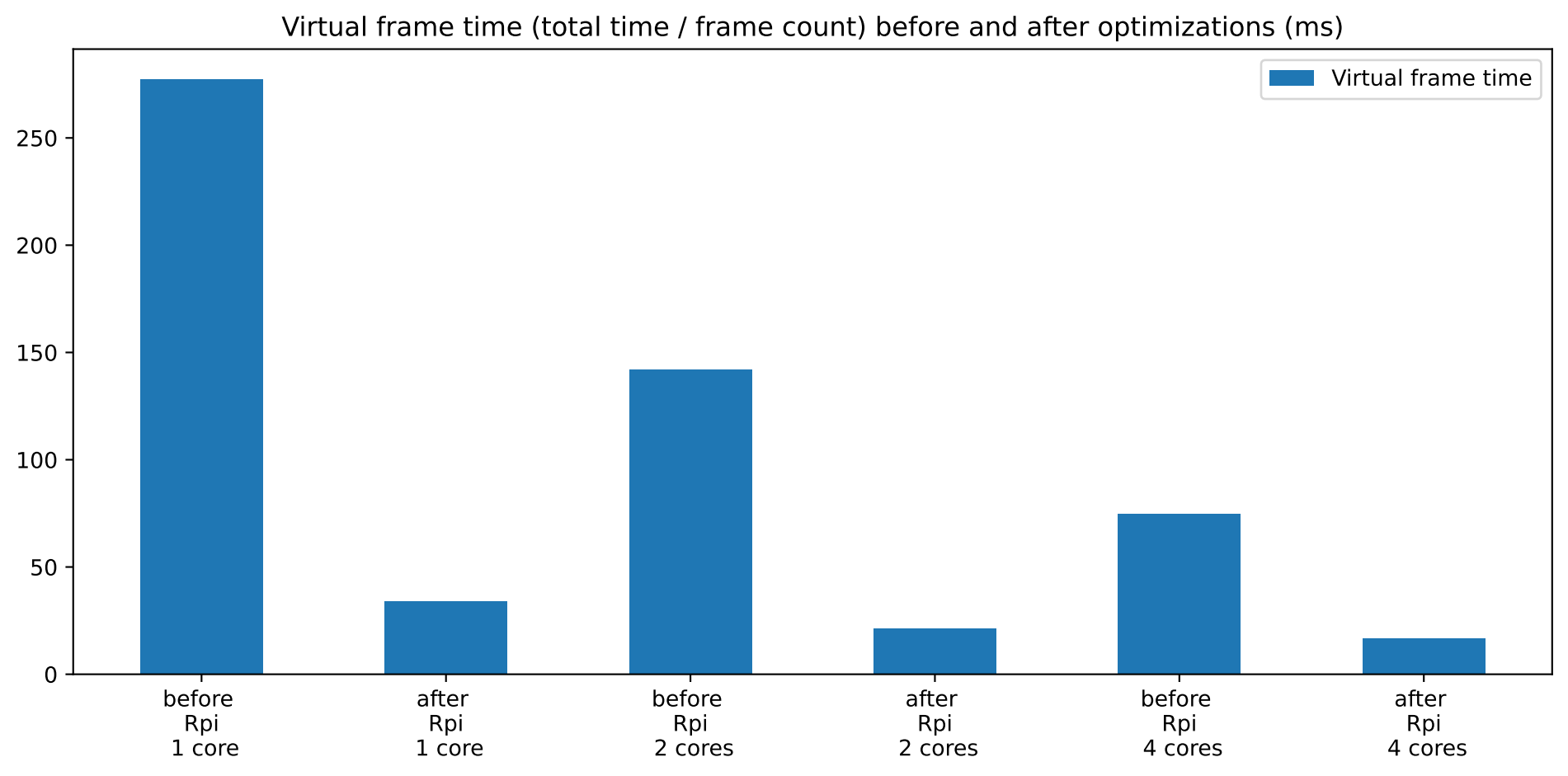

Virtual frame time (total time / frame count) depending on resolution (ms)
virtual frame time
0.0
0.2
0.4
0.6
0.8
full res x86 2 cores
half res x86 2 cores
quarter res x86 2 cores
full res x86 4 cores
half res x86 4 cores
quarter res x86 4 cores
full res x86 8 cores
half res x86 8 cores
quarter res x86 8 cores


Virtual frame time (total time / frame count) depending on resolution (ms)
virtual frame time
0
5
10
15
20
full res
Rpi
2 cores
half res
Rpi
2 cores
quarter res
Rpi
2 cores
full res
Rpi
4 cores
quarter res
Rpi
4 cores
half res
Rpi
4 cores


Virtual frame time (total time / frame count) with colored of grey scaled frames accumulator (ms)
virtual frame time
0.0
0.2
0.4
0.6
0.8
colors
x86
2 cores
grey scale
x86
2 cores
colors
x86
4 cores
grey scale
x86
4 cores
colors
x86
8 cores
grey scale
x86
8 cores


Virtual frame time (total time / frame count) with colored of grey scaled frames accumulator (ms)
virtual frame time
0
5
10
15
20
colors
Rpi
2 cores
grey scale
Rpi
2 cores
colors
Rpi
4 cores
grey scale
Rpi
4 cores


Virtual frame time (total time / frame count) before and after optimizations (ms)
Virtual frame time
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
before x86 1 core
after x86 1 core
before x86 2 cores
after x86 2 cores
before x86 4 cores
after x86 4 cores
before x86 8 cores
after x86 8 cores
before x86 16 cores
after x86 16 cores


Virtual frame time (total time / frame count) before and after optimizations (ms)
Virtual frame time
250
200
150
100
50
0
before Rpi 1 core
after Rpi 1 core
before Rpi 2 cores
after Rpi 2 cores
before Rpi 4 cores
after Rpi 4 cores