Lernplattform Moodle
Technische Universität München

Begonnen am	Donnerstag, 30. April 2020, 03:16
Status	Beendet
Beendet am	Donnerstag, 30. April 2020, 04:28
Verbrauchte Zeit	1 Stunde 11 Minuten
Bewertung	**10,00** von 10,00 (**100**%)

Information

Two of your fellow students and you have teamed up to form the most ambitious team in this semester of IN2147 Parallel Programming. Naturally, your team wants to take first place on the leaderboard of fastest submissions. You have 1 week's time to submit your solution and can designate each team member to either work on optimizing the code or parallelizing it. For every student working on optimizing code, the code's runtime is reduced by 20% in both sequential and parallel sections. For every student working on parallelization, the fraction of total parallelized code increases by 30%. The submission server has 4 cores running at a constant 2.8 GHz for you to do computations on and the original implementation has a runtime of 10 seconds.

Frage 1

Richtig

Erreichte Punkte 1,00 von 1,00

How many students do you assign to parallelizing the application assuming you want to minimize runtime?

Wählen Sie eine Antwort:

- 0
- 1
- 2
- 3 ✔

Your answer is correct.

Die richtige Antwort lautet: 3

Frage 2

Richtig

Erreichte Punkte 1,00 von 1,00

What is the minimal runtime you can achieve in seconds?

Antwort: 3,25 ✔

Die richtige Antwort ist: 3,25

Information

One of your teammates in "Team Ambition" has had some prior experience with parallelizing code. They sent you this parallelization of a wave simulation:

```
#define SIZE 100
```

```
float waveData[SIZE];

void sequential() {
    for(int i = 0; i < SIZE; i++) {
        // Average the current, left, and right values into the current cell
        // i - 1 + SIZE % SIZE ensures that the returned index is always positive
        waveData[i] = (waveData[i - 1 + SIZE % SIZE] + waveData[i] + waveData[i+1 % SIZE]) / 3;
    }
}

void parallel(int myIndex, int worldSize) {
    int blockSize = SIZE / worldSize;
    for (int i = myIndex * blockSize; i < (myIndex + 1) * blockSize; ++i) {
        waveData[i] = (waveData[i - 1 + SIZE % SIZE] + waveData[i] + waveData[i+1 % SIZE]) / 3;
    }
}
```

The parallel implementation is called on two different threads with the parameters parallel(0, 2) and parallel(1,2). Assume that they are sharing memory in the waveData array.

Frage 3

Richtig

Erreichte Punkte 1,00 von 1,00

Will running the sequential program twice produce the same output?

Wählen Sie eine Antwort:

- (•) Yes ✔
- ( ) Maybe
- ( ) No

Your answer is correct.

Die richtige Antwort lautet: Yes

Frage 4

Richtig

Erreichte Punkte 1,00 von 1,00

Will running the parallel program twice produce the same output?

Wählen Sie eine Antwort:

- ( ) Yes
- ( ) No
- (•) Maybe ✔

Your answer is correct.

Die richtige Antwort lautet: Maybe

Frage 5

Richtig

Erreichte Punkte 1,00 von 1,00

Will the sequential program output the same information as the parallel program?

Wählen Sie eine Antwort:

- ( ) Yes
- ( ) No
- (•) Maybe ✔

Your answer is correct.

Die richtige Antwort lautet: Maybe

Information

Due to "Team Ambition's" success, you were allowed to run the LINPACK benchmark used in the TOP500 on the shiny new SuperMUC-NG system. You want to measure how well the benchmark scales across the machine. You run your first measurement on a single core of the computer, achieving an average throughput of 0.065 TFlop/s. Next, you run the benchmark again on the entire machine, using all cores of all of the thin nodes. This achieves a peak throughput of 20 000 TFlop/s.

Note: Parts of this question might require additional data of the SuperMUC-NG found here: https://doku.lrz.de/display/PUBLIC/Hardware+of+SuperMUC-NG

Frage 6

Richtig

Erreichte Punkte 1,00 von 1,00

What is the speedup you observed (rounded to the nearest integer)?

Antwort: 307692 ✔

Die richtige Antwort ist: 307692

Frage 7

Richtig

Erreichte Punkte 1,00 von 1,00

What is the parallel efficiency you observed (to four significant digits)?

Antwort: 1,012 ✔

Die richtige Antwort ist: 1,012

Frage 8

Richtig

Erreichte Punkte 1,00 von 1,00

Is this result reasonable?

Wählen Sie eine Antwort:

- ○ Yes
- ○ No
- ◉ Maybe ✔

Your answer is correct.

Die richtige Antwort lautet: Maybe

Frage 9

Richtig

Erreichte Punkte 1,00 von 1,00

What reasons suggest this result is unreasonable, if any?

Wählen Sie eine oder mehrere Antworten:

- ☑ Superlinear speedup ✔
- ☐ Network overload
- ☐ Dynamic Frequency Scaling (e.g. Turbo Boost)

- [ ] Memory Bandwidth
- [ ] Cache effects
- [x] Lack of parallel efficiency loss on a large scale ✔

Your answer is correct.

Die richtigen Antworten sind: Superlinear speedup, Lack of parallel efficiency loss on a large scale

Frage 10

Richtig

Erreichte Punkte 1,00 von 1,00

What reasons suggest this result is reasonable, if any?

Wählen Sie eine oder mehrere Antworten:

- [x] Cache effects ✔
- [ ] Lack of parallel efficiency loss on a large scale
- [x] Memory Bandwidth ✔
- [ ] Superlinear speedup
- [ ] Dynamic Frequency Scaling (e.g. Turbo Boost)
- [ ] Network overload

Your answer is correct.

Die richtigen Antworten sind: Cache effects, Memory Bandwidth

◀ Exercise 1 Slides Direkt zu: Teamfinding Forum ▶