NREL/MK-6A42-76597
April 2020

NRELEd: Super Table Setting

Developed by Meghan Pearson and Tom Mason, NREL Education Center

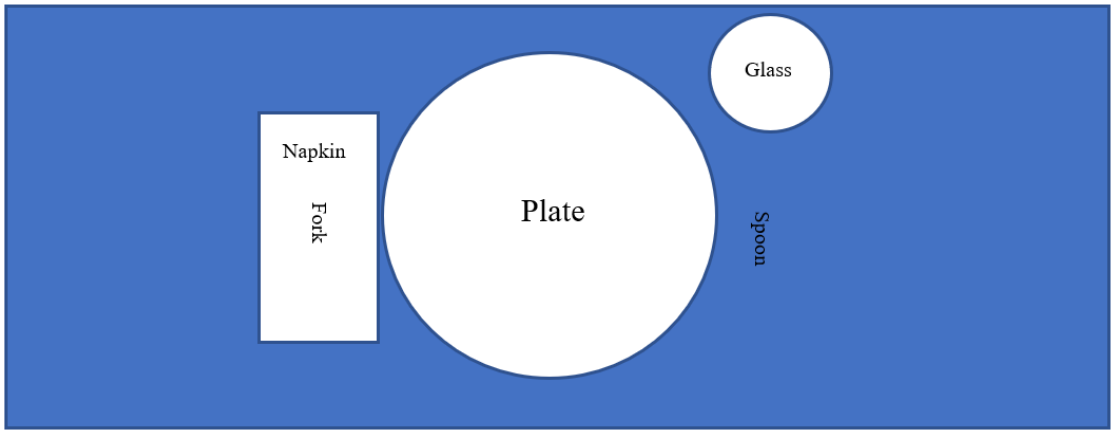
Background

Today, almost all people have some form of a computer in their household. Some households may even have more than one. Home computers come in many different forms: laptops, cell phones, tablets, and desktops. People use computers to make their lives easier. Computers can handle many tasks faster than humans. For example, it is much faster for me to type a paper rather than hand write a paper Computers can also send emails, which is much faster than sending a letter. They can also do math calculations faster than most people can do with pencil and paper.

However, if a home computer were to try to do too many calculations at one time, it would begin to perform very slowly. Think about how long it takes to load web pages when there are too many tabs open in an internet browser. Home computers are limited in how much data they can process at one time. This is why scientists use super computers. Super computers can do many calculations all at once. NREL's super computer is named Eagle (upgraded from Peregrine in 2019). NREL's scientists use Eagle to do complex calculations and simulations. They can then turn that data into models.

Serial Table Setting vs. Parallel Table Setting

You will set two table settings just like the picture below. Time yourself to see how long it takes you to complete each task. If you have a sibling, you can race to see who is the faster table-setter. Plastic plates and silverware might make this activity safer if they are available.



15013 Denver West Parkway
Golden, CO 80401
Phone 303-275-3000

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

What you need:

Preferably plasticware and paperware. Everything will still be usable

- 2 of each: fork and spoon
- 2 glasses
- 2 plates
- 2 napkins
- Stopwatch

Serial Table Setting

For this round, you can only take one item at a time, but you can put together the table settings as you put the items on the table. For example, if you start with the plate, you can put the plate in the center, then grab the fork and put it to the left of the plate (see the picture above), and so on.

1. Place all of the pieces in a bin or on a countertop.
2. Prepare the stopwatch. It may be easier to have someone else tell you to go, but you can always hit the start button for yourself.
3. Grab one fork, run it to the table, and start the first place setting. Run back.
4. Grab the next item, run it to the table, and place it where it belongs. Continue this until both place settings are completed.

How long did it take you? Write down your time so you can remember.

Parallel Table Setting

You will repeat the process from above, but now you can grab both of the same item. For example, you can grab both forks. You may not grab one fork and one spoon. They have to be the same item. You also cannot start building the table settings until all the items are on the table. So, you can start by grabbing both plates, but they need to stay stacked until everything for the table settings is on the table. Once all 10 items are on the table, you can put together the two table settings.

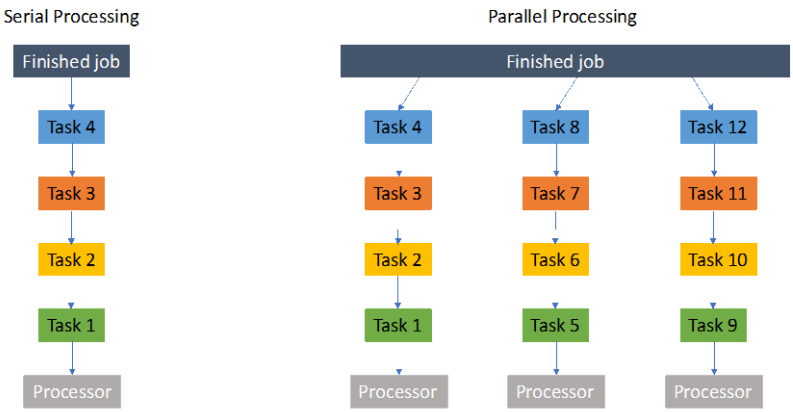
1. Place all of the pieces in the same location as before.
2. Start the Stopwatch.
3. Grab both of any of the items, place them on the table, return.
4. Grab the next two items, place them on the table, and return.
5. Do this until all 10 items are on the table.
6. Put together the table settings as they appear in the picture.

How long did it take you? Which one was faster? What was slower during the parallel round?

The Science!

The first round simulates serial processing. You could only grab one part of the place-setting at a time and you were responsible for completing both sets. Home computers use serial processing to complete tasks. One processor completes one task at a time, in order, until a job is complete. This works well enough for everyday calculations.

The second round simulated parallel processing. You could only grab one part of the place setting, but you had a partner who was also working on completing the job. With two place settings, it might not have been that much faster, but imagine you were setting the table for a large family meal, like Thanksgiving dinner with all your cousins, friends, neighbors, and family. Having more people to help set the table would make a big difference in the time it would take.



Supercomputers use parallel processing for the same reason. They need to accomplish big jobs with lots of tasks quickly. Supercomputers have millions of processors that each do one of tasks needed to complete a job. This allows for millions of calculations to be completed at the same time. NREL's scientists write programs that enable the Eagle supercomputer to analyze data needed to complete a project, like modeling a potential site as a wind farm, or simulating how a new salt crystal might react in different conditions.

NREL researchers can also use this data to create models they can walk around in using the Visualization Laboratory.