MapReduce Education Resource

Overview

This exercise aims to teach children about the MapReduce function that is a part of the software library Hadoop. The main idea of MapReduce is to decompose large tasks into smaller tasks that can be computed in parallel across multiple servers. It consists of a Map function which breaks the tasks down, and then a Reduce function which collects the output from Map and combines them back up into a data set.

Suitable For

Primary school children - 8+, can be adapted to suit older children by using a more complicated story.

Key Concepts

MapReduce function that comes with Hadoop, idea of parallelism, using multiple cores, word counting

Learning Outcomes

* Understand what the MapReduce function is used for
* Remember what the MapReduce function is
* Apply the knowledge of MapReduce to count a series of words from a story.
* Understand how it maps (splits up) the tasks and reduces (collates) them back together through the use of a wordcount example.
* Understand how a computer might count (specific) words in a book or a story.
* Analyse the need for MapReduce in a computer system.

Success Criteria

* I can understand the need for a MapReduce function when doing large menial tasks.
* I can see how a computer might use MapReduce in order to count specific words from a large section of text.

Time Required

1 period - 1 hour

Preparation

1. Print out a page from the story.docx for each group of three.
2. Print out the tally board from tallyBoard.docx for every member of the class, each member should have their own board to note down any of the words they find.

Prior Learning Assumed

None - new topic

Outline of Activity

1. Split the class up into groups of three, if there are any students left over just add them to a group or have them work in a two.
2. Outline to the students that you are going to be studying an important computing concept called MapReduce. It allows you to break up huge tasks into smaller more manageable ones in order to be completed quicker.
3. Say that each group has a section from a chapter of Alice in Wonderland and say that you want to count how many times the names ‘Hatter’ ‘Alice’ and ‘Dormouse’ appear in the story they are given.
4. Say that a really slow and bad way of counting would to have one person go through the entire story and pick out the individual words and count them by themselves, perhaps go through this on the board yourself by picking out a helper from the class in order to demonstrate this fact if you have time.
5. Then explain that by using teamwork, you can split up this big task into smaller tasks to solve it more quickly. Say that each member of the team is going to look in their paragraph section of the story, and count up the word total.
6. Give each group a section of the story and ask that they cut alone the dotted lines, each member of the group getting a third of the A4 page. Outline that they will have to each individually count the number of time each word appears. Make sure each student has a section from their page and their own tally board.
7. If the children know about tally marks, outline that they should use their board on the desk to tally up each time they find the word in the story. Explain that this is called ‘Mapping’ and that this is the computer counting each time the word appears individually.
8. Leave them for about 5 minutes to count up each word, and then gather their attention again at the end.
9. Ask each group individually to say how many times they found each word in their section. Even add a little bit more interactivity into it by getting them to come up to the board to put their totals in - like a race. Keep a count on the board from each group, with a ‘total’ underneath. Explain that this is ‘reducing’ - putting back together the split up totals each section has.
10. Once each group has reported back, add up the total at the bottom and explain that you have counted up how many times each word has individually appeared in the story - and that it was much much quicker than one person standing alone and counting up individually how many times each word appeared, and this is how MapReduce works.