The Santa Problem

The Santa Problem

Santa Claus sleeps in his shop up at the North Pole, and can only be wakened by either all nine reindeer being back from their year long vacation on the beaches of some tropical island in the South Pacific, or by some elves who are having some difficulties making the toys. One elf's problem is never serious enough to wake up Santa (Otherwise, he may never get any sleep), so, the elves visits Santa in a group of three. When three elves are having their problems solved, any other elves wishing to visit Santa must wait for those elves to return. If Santa wakes up to find three elves waiting at his shop's door, along with the last reindeer having come back from the tropics, Santa has decided that the elves can wait until after Christmas, because it is more important to get his sleigh ready as soon as possible. (It is assumed that the reindeer don't want to leave the tropics, and therefor they stay there until the last possible moment. They might not even come back, but since Santa is footing the bill for their year in paradise... This could also explain the quickness in their delivering of presents, since the reindeer can't wait to get back to where it is warm.) The penalty for the last reindeer to arrive is that it must get Santa while the others wait in a warming hut before being harnessed to the sleigh.

The System

- We’re going to design a solution to this to be implemented in PyCSP.
- Let us imagine that each Process (Santa, Reindeer, Elves) is each on a separate device.
- We can break those Processes down into as many Sub-Processes as we need.

Santa

- Santa sleeps forever
- He will be woken by a group of all 9 Reindeer.
- When woken by Reindeer he will take all of them to deliver presents for a finite amount of time.

Reindeer

- There are 9 identical Reindeer.
- They will go on holiday for a random finite length of time.
- The last to return to the North Pole will alert Santa that they have all arrived.
- Santa will then lead them to deliver presents.

Expanding the Problem

- Lets add in the Elves to make it a bit more complicated.
- The Reindeer function as before.
- If both a group of Elves and all the Reindeer are waiting for Santa, he should always choose the Reindeer.
- Groups of Elves are served first come, first served.

Elves

- There are 10 identical Elves.
- They will build toys forever. After a random finite amount of time they will encounter a problem.
- If they encounter a problem they will need to consult with Santa before resuming their work.
- Elves can only consult in groups of exactly 3.