DS Coursework

Jacob Essex
s1040340

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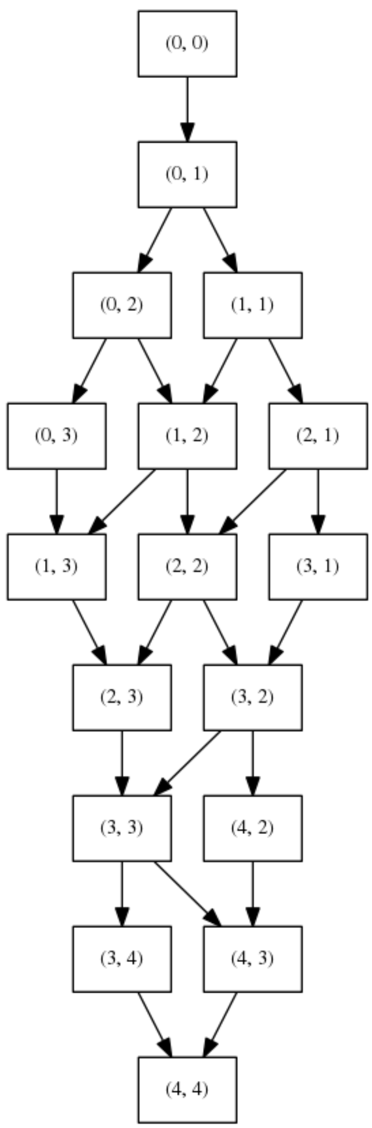
Q1



Q2

To avoid starvation an alogirthm needs to be fair (i.e. requests for a lock are honored in the order that they are made). This prevents starvation. A system that is libable to have starvation is one that always grants the request of the most recent request.

Q3

Data is trasnfered between nodes. This data is of fixed size and is represented using the following tuple

$$(\text{sum of all p.f seen}, \text{max of all p.f seen}, \text{number of processors seen})$$

The algorithm is as follows:

Each leaf sends its $(p.f, p.f, 1)$ to its parent

On recipt of all data $(sum_i, max_i, count_i)$ from its ith of n children each node p sends the following data to its parents unless it is the root node in which case it does nothing

$$(p.f + \sum_i^n sum_i, \text{MAX}(p.f, max_1, max_2, ...max_n), 1 + \sum_i^n count_i)$$

The root node will then hold $(\text{sum}, \text{max}, \text{count})$ It then preforms the following operation on its tuple to product a new tuple

$$(\text{avg}, \text{max}) = (\text{sum}/\text{count}, \text{max})$$

This new tuple now contains the needed result.

The message length is fixed, so the cost of sending a message is fixed. In the worst case, the minimum spanning tree represents a single line of processors. In this case O(n) messages need to be sent taking O(n) time as the cost to send a message is fixed.

Q4

The diameter of the network is defined by the longest shourtest path. In the case the diameter of the weighted graph this is: $d \to h \to l \to m$

If each edge had a weight of 1 then the following paths of cost 5 would realise this: $e \to a \to c \to g \to l \to m$ and $e \to a \to c \to f \to i \to k$

Of course in both cases as the graph is undirected the reverse paths would also give the same results