Questions

1. Customer 8 had 457 items

Customer 7 had 441 items

Customer 9 had 433 items

1. Polling at the leaf level results in a constant number of total polls which is equal to 2k where k is the item address length or the max level in the binary tree. This is because it is the last level in the binary tree and there are only m node that can be searched linearly.

In this case the K is 10 and there are 1024 node at the leaf level there fore each time you search there will be 1024 polls.

1. Customer 8’s basket takes the most time with 997 polls. This is due to the fact that this basket has the most items and therefore has a lot of collisions.
2. Customer 1’s basket takes the least time with 35 polls. This is due to the fact that this basket has the least items and the next ratio ready nodes and number of nodes at a level, as explained in the bonus part.
3. Customer 8’s basket generates the most collisions - 498.
4. Customer 8’s basket has the highest proportion of successful slots with 45.83%.

Bonus

1. To achieve the highest proportion of successful polls the number of ready nodes must equal the number of polls taken.

Based on the expected node that are ready to transmit we can use the above equation to find the optimal level to start polling at. This is implements in code and the improvements can be seen in the results section.

1. Least say you poll a node and it results in a collision then you poll the left child and it results as idle. Then you know that the right child will result in a collision so it would be better to poll the child nodes of the right child which would save you one polling slot. This is implements in code and the improvements can be seen in the results section.

Results

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test | | | | |
| Type | Idle Avg | Success Avg | Collision Avg | Total Avg |
| Root | 0.54 | 3.62 | 3.15 | 7.31 |
| Leaf | 4.38 | 3.62 | 0.00 | 8.00 |
| Improved | 0.54 | 3.62 | 2.92 | 7.08 |
| Estimate Level | 1.15 | 3.62 | 0.92 | 5.69 |
| Improved Estimate Level | 1.15 | 3.62 | 0.77 | 5.54 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Customer | | | | |
| Type | Idle Avg | Success Avg | Collision Avg | Total Avg |
| Root | 38.40 | 255.20 | 292.60 | 586.20 |
| Leaf | 768.80 | 255.20 | 0.00 | 1024.00 |
| Improved | 38.40 | 255.20 | 275.70 | 569.30 |
| Estimate Level | 93.30 | 255.20 | 96.90 | 445.40 |
| Improved Estimate Level | 93.30 | 255.20 | 90.40 | 438.90 |