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BSCS - 3C

## **The “Analog-to-Digital” Parallel Challenge**

### **Real-World Bottleneck Discovery: Limketkai Mall Entrance Inspection**

The identified bottleneck for this activity was Limketkai’s mall entrance inspection. This views the mall entrances and guardsmen posted at each of the entrances as the real-world example for a bottleneck, this was due to the limited number of entrances present within the mall and the limited number of guardsmen posted at each entrance. These limitations naturally create a bottleneck for the mall visitors that want to enter the mall, especially during peak hours/days where mall visitors exponentially increase. It is also worth noting that these limitations not only create long lines of mall visitors waiting to get into the mall, it also increases the likelihood for human error during inspection as large quantities of mall visitors may prompt the guardsmen to not properly examine the contents of a visitor’s bag.

The improvement that we chose was task parallelism, specifically pipeline parallelism. Pipeline parallelism functions by processing multiple stages of a task at the same time, this decision was motivated by 3 constraints: limited entrances, limited guardsmen, and contraband response time per convicted mall visitor. Instead of the traditional gender related examinations, which would be similar to data parallelism, we used pipeline parallelism to achieve a thorough inspection while still accommodating a large amount of mall visitors despite the 3 proposed constraints.

### **Parallel Mapping**

Work unit:

- Inspect mall visitor task
- Mall visitor inquiry task

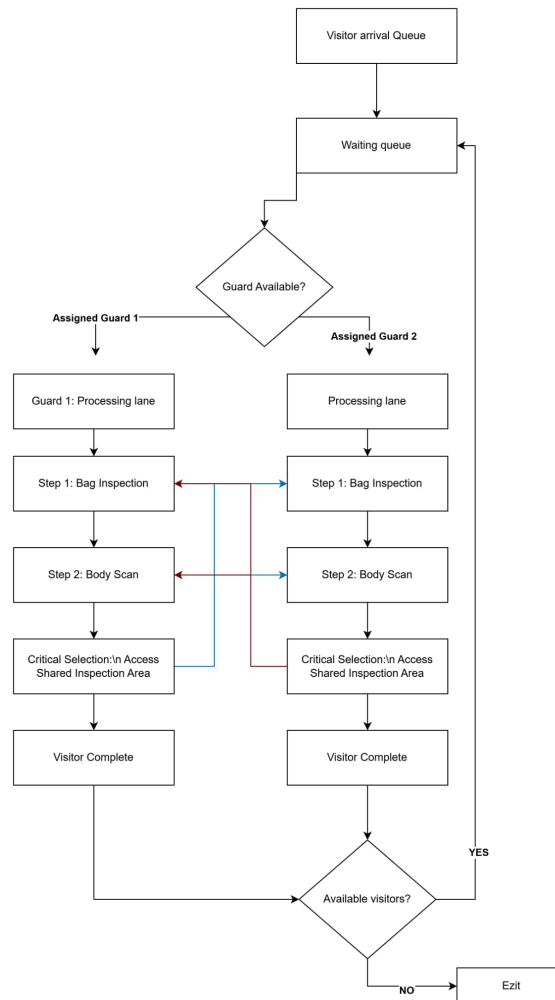
System Constraints:

- Limited Entrances
- Limited Personnel
- Apprehension time

Parallelism Strategy:

- Task Parallelism (Pipeline parallelism) - Splits the tasks into parts that can be undertaken by different personnel at the same time.

## FLOWCHART:



## BENCHMARK REPORT:

Sequential time: 7.50s

Parallel time: 5.51s

Speedup: 1.36s

### Analysis:

The relatively low speedup time may be due to the real-world bottlenecks of entrances and guardsmen. Limketkai only has 4 main entrances into the mall with only 2-3 guardsmen available at each entrance, which contributes to overall inspection time. Despite this, there is still a 36% speedup if pipeline parallelism is used when compared to sequential time, indicating a positive decline of waiting time for the mall visitor.