Urban-Scaled Traffic Management Using FCD

Goals

- Gaining experience on distributed computing and real-time data processing
- Integrating the algorithms into the infrastructure
- Real-time processing of FCD
- Using FCD for incident detection and junction management

Challenges

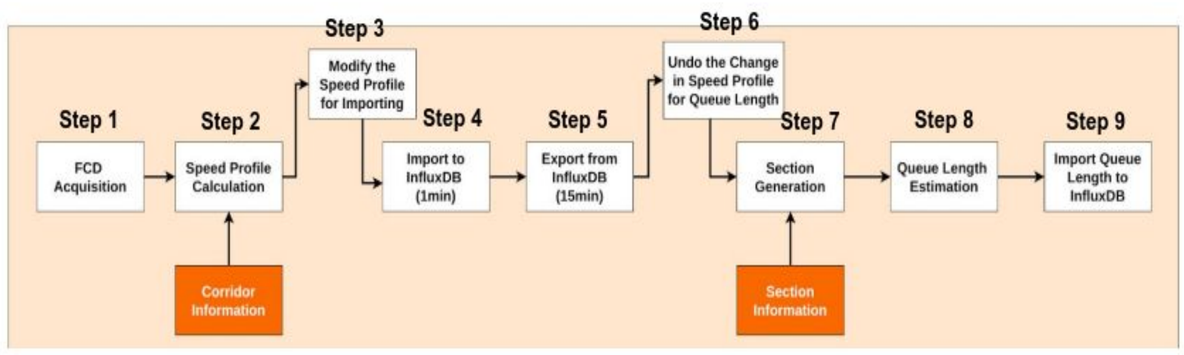
- Lack of experience in the topic
- Determining optimum hardware properties and tools
- Running algorithms in parallel with flowing data in one minute
- Processing data in the fastest way in terms of computation time

Hardware & Tools

Technologies	Nr of VMs	CPU per VM	Mem per VM	Disk per VM
Dask Kubernetes	4	4 core	16 GB	1 TB
InfluxDB	1	8 core	16 GB	2 TB

Results

- Step 3 and Step 6 cost extra processing time
  - InfluxDB was not very suitable for our data



More Results

- Needed more virtual machines to increase processing power

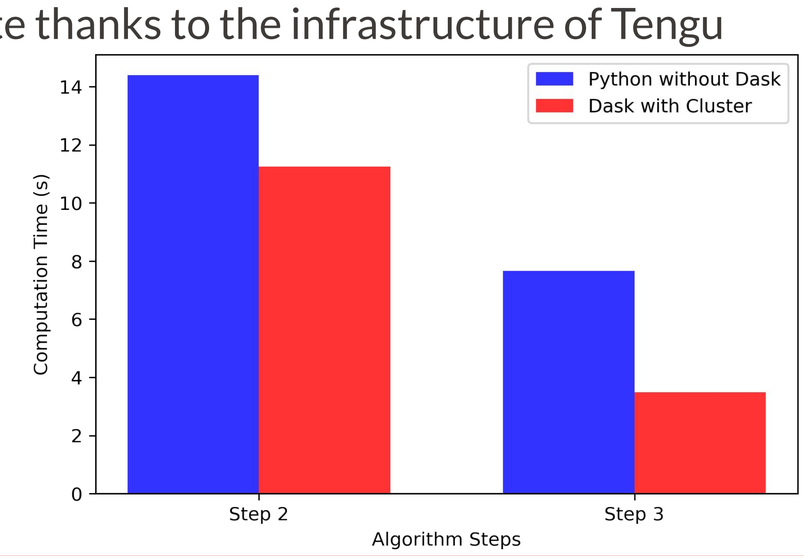
Tengu

```
Client                                  Cluster
Scheduler: tcp://my-dask-scheduler:8786 Workers: 3
Dashboard: http://my-dask-scheduler:8787/status Cores: 12
                                        Memory: 50.46 GB

def square(x):
    return x ** 2

def neg(x):
    return -x

start = time.time()
A = c.map(square, range(10000))
B = c.map(neg, A)
total = c.submit(sum, B)
print(total.result())
end = time.time()
print(end-start)

-333283335000
8.472558736801147
```

Local

```
Client                                  Cluster
Scheduler: tcp://127.0.0.1:34475        Workers: 4
Dashboard: http://127.0.0.1:8787/status Cores: 12
                                        Memory: 8.20 GB

def square(x):
    return x ** 2

def neg(x):
    return -x

start = time.time()
A = client.map(square, range(10000))
B = client.map(neg, A)
total = client.submit(sum, B)
print(total.result())
end = time.time()
print(end-start)

-333283335000
3.784132957458496
```

- However, we have managed to run algorithms for 10 corridors of Mersin province simultaneously within one minute thanks to the infrastructure of Tengu



Conclusion

- The final outputs of the experiment are section-based speed profile and queue length information which were calculated in real-time on urban scale
- Obtaining queue length information in real-time gave us the opportunity to detect incidents with FCD, and we have implemented this algorithm and integrated it with the developed web user interface

Post Mortem

- Enhancing know-how with the tools used for the first time and experience gained
- Re-applying to the Stage 2 for more complex algorithms and tests with an improved infrastructure
  - Junction management with FCD
  - Using different tools for performance comparison
  - Finding the optimal infrastructure

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