Fun Project on Fog Computing

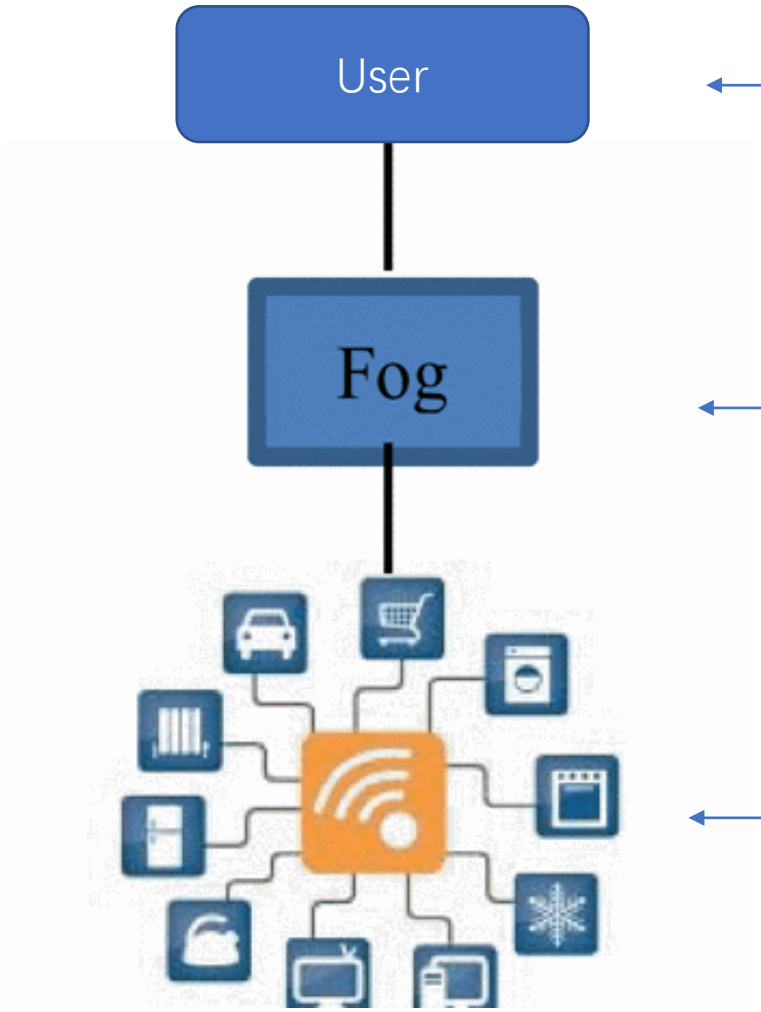
Fog Computing is a derivative concept of Cloud Computing
"Fog" stands for "Cloud on the ground"

Fog Computing is an architecture that uses edge devices to carry out a substantial amount of computation (edge computing), storage, and communication locally and routed over the Internet backbone.

Where to apply Fog computing:

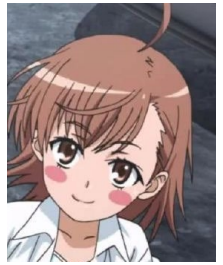
Require low-latency but need to cope with big data volumes, advantage on distance of local server (Compared to distance between user and the data-center in Cloud Computing) can provide low latency response, and Fog Computing is natural parallel which can increase the computing speed by applying distributed computing. Additionally, Fog Computing can release the high pressure on bandwidth of data-centers.

Architecture of Fog Computing



User

Task Management Node



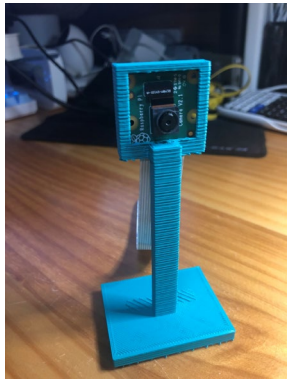
Computing Nodes

Misaka Network

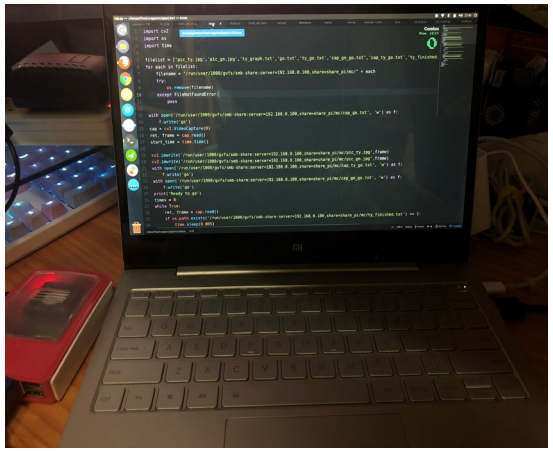
--《A Certain Magical Index》2004

An investigation on fog computing

Experimental Architecture :

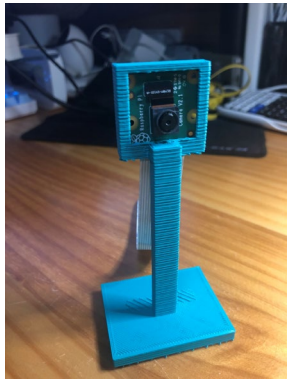


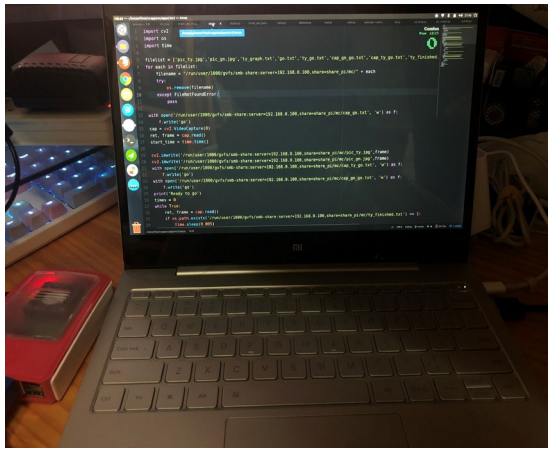
User:
Camera that is unable(too slow) to process frame classification



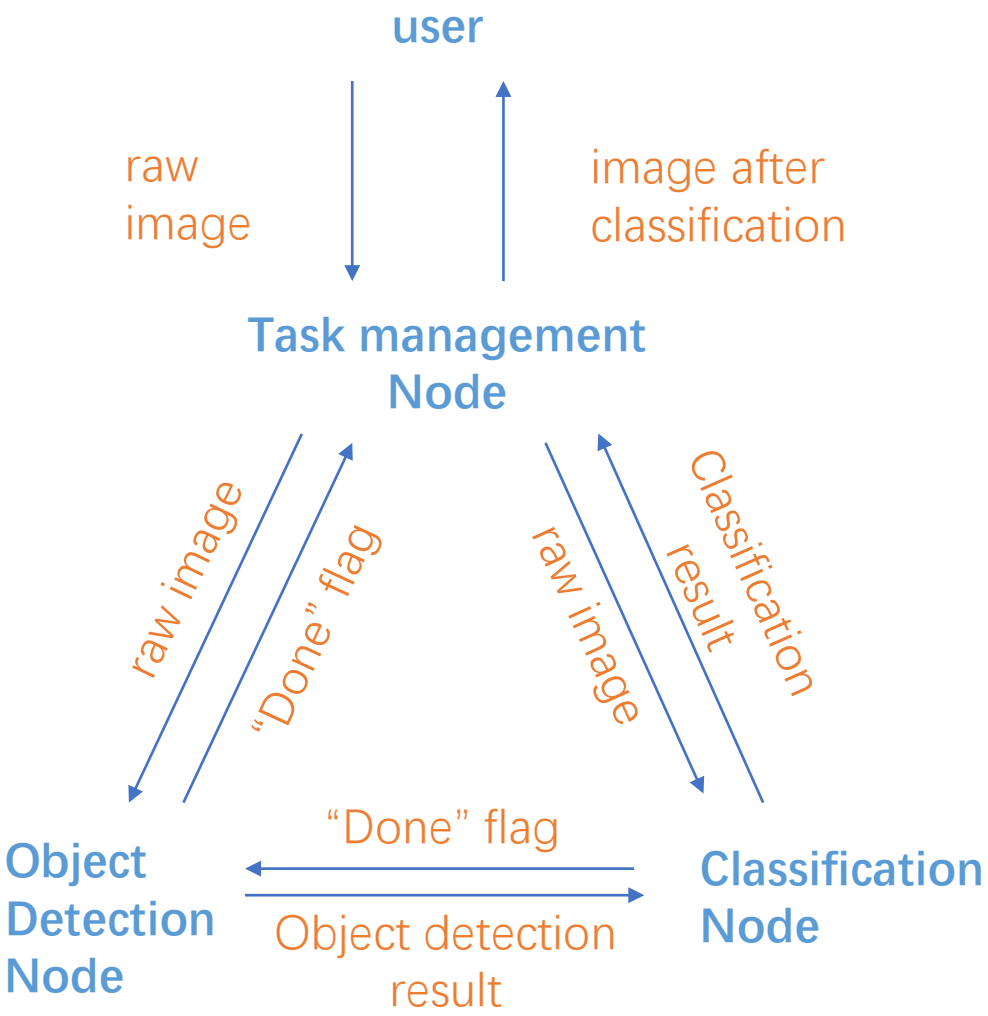
Task Management Node:
Xiaomi m3 laptop

Computing Nodes:
Two Raspberry Pi equipped with one Intel Movidius Neural Compute Stick (NCS) on each






Movidius
Movidius


user
raw image
image after classification
Task management Node
raw image
"Done" flag
raw image
Classification result
"Done" flag
Object Detection Node
Object detection result
Classification Node

Total time consumption:

	time(s/frame)
Fog	1.39
Xiaomi m3	2.21
NCS at local	0.15

1000 frames average

Time consumption of each node:

	time(s/frame)
Task Management Node	0.33
Object Detection Node	1.31
Classification Node	1.33

500 frames average

Object Detection Node:

	time(s/frame)
Object Detection Processing	0.03
Communication with Task Management Node	0.35
Communication with Classification Node	0.64
Cleaning Cache	0.07

200 frames average

Classification Node:

	time(s/frame)
Object Detection Processing	0.04
Communication with Task Management Node	0.44
Communication with Object Detection Node	0.58
Cleaning Cache	0.21

200 frames average

Conclusion:

1、Local server with computing resources can provide services for client in need, the tasks can be processed in parallel with proper task management (total processing time = 1.39 s/frame ≈ max{1.31s/frame, 1.33s/frame}, what causes the delay should be investigated)

2、In this projects, data is transferred through reading and writing the txt and jpg profile. Object Detection Node also serves as constructing the local network when processing object detection, and the experiment resulted shows that data transmitting consumes a large amount of time, a more efficient communication protocol or file format may reduce the delay.