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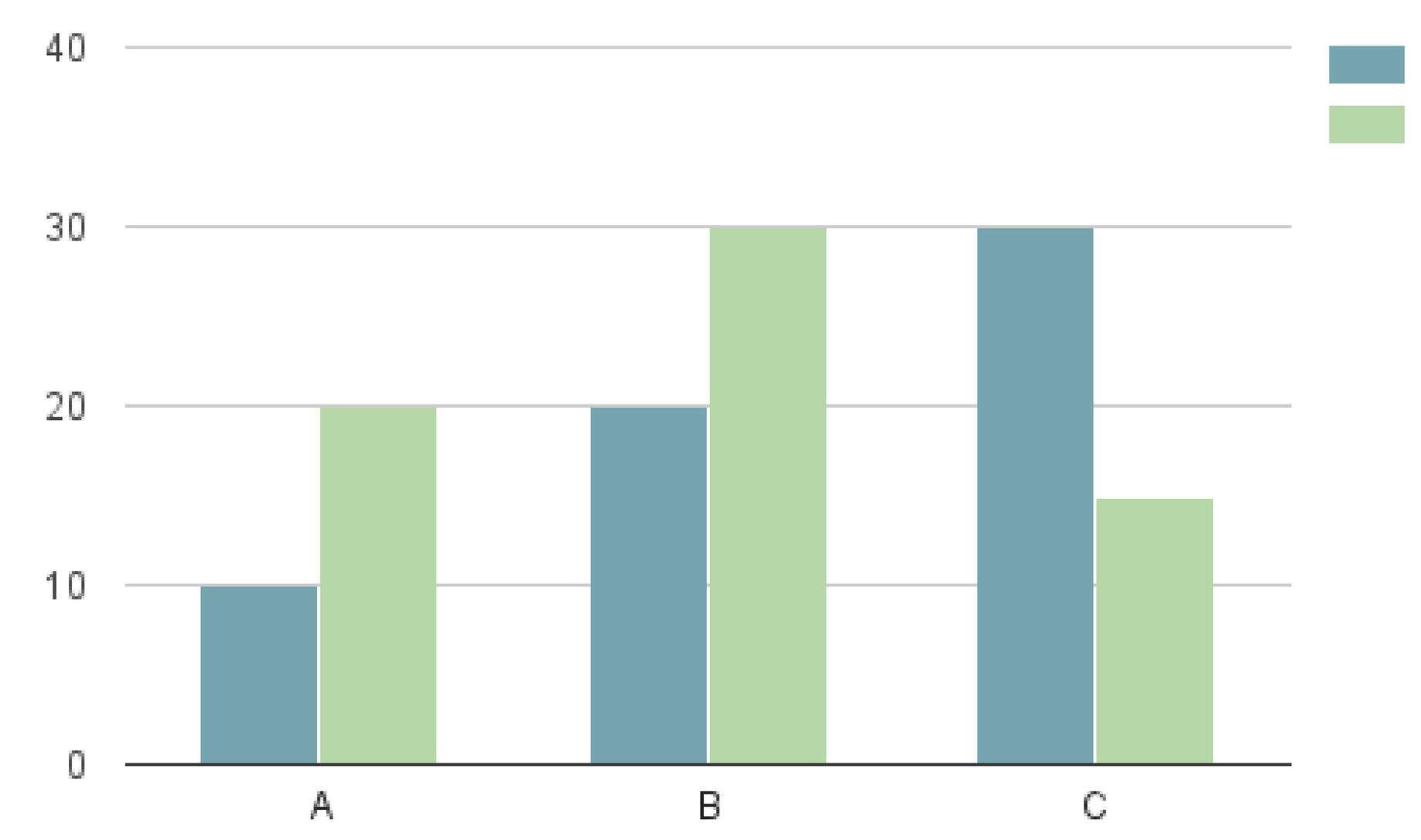

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Decentralized IoT

Orcestration manager for IoT a decentralized IoT application

GOAL

The Goal of the project is to create a :

- An orchestration manager that helps IoT devices communicate with each other
- Design a run time framework with which all the devices can interact with each other and is customizable and deployable
- Manage the entire network without any extra piece of hardware

Why is it required?

1. In current state of art all the devices rely on cloud based backend to communicate and interact with each other
2. This introduces latency and data redundancy in the system. [Sending data over the network is very energy expensive]
3. Also, with devices becoming more processing efficient, they can process and do some computations on the device itself instead of transferring over the network
4. Have an application framework with which all the devices can interact with each other

POA vs POD

Cloud based Architecture vs Decentralized Architecture

Abstract Model of Framework

- The framework works by making use of some abstract methods that control the computation models and the degree of communications with the device
- The properties for the network are set one time by supplying a config file (YAML) that defines the behavior of the network

Framework Implementation

The App running on devices is based out of :

1. Flask
2. Sqlite

The config file is : YAML

The compiler for processing config is based out of :Python

Framework Abstract Methods

The framework categorizes into 2 types of devices:

1. Device
2. Device Manager

The devices communicate with each other through **GET** API's

The system is governed by these 3 variables:

1. State
2. Event
3. Action

Some of the API's of the framework are :

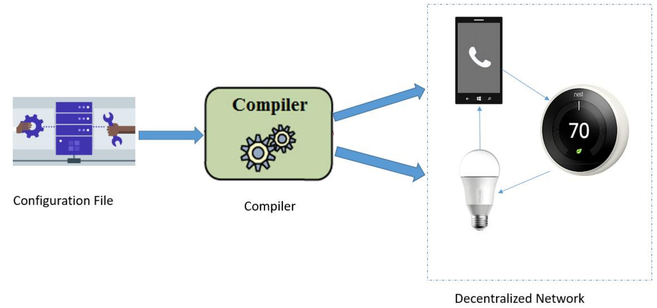
Device :

- receive action
- receive state change
- force update metadata
- set mode operation
- set mode communication
- update manager meta

Manager:

- receive state change
- receive heart beat
- receive registration
- receive deregistration
- update metadata device

Sample Use Case :



The above network has 3 devices:

- Mobile phone
- Light bulb
- Thermostat

1. It starts with user providing the config file.
2. Then compiler processes the config file and produces 3 different code packets that is shipped to the devices
3. One of the device is picked as a manager
4. The manager and devices communicate within the network without relying on cloud

Future Work

The Framework could be extended to produce :

- A distributed model with varied computation and communication to support different types of networks
- Choosing a different manager on failure of one
- Failure recovery and data backup
- More generalization of the framework to support more features