

Demonstration of IPOP Overlay VPN Application in Distributed Processing of Video Streams

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<http://IPOP-project.org>

Background and Motivations

Smart security is the future, and with the use of the open source community and technology available today, an affordable intelligent video analytics system is within our reach. In such a system, secure and effective communication between the nodes would be a key feature.

IPOP (IP-Over-P2P) is an open-source infrastructure to connect different network entities together in a secure and scalable Virtual Private Network (VPN) with peer-to-peer connections. Furthermore, IPOP works even if both sides of the connections are behind NATs and/or firewalls which distinguishes it from most of other VPN solutions.

Demo Structure

This application demo aims to show how IPOP VPN can be used in a real-world IoT application to connect multiple real and virtual devices at different geographical locations, where each device may be on a different network behind several NATs and/or firewalls.

The application demo makes use of four different entities:

- **XMPP Server:** An XMPP service to bootstrap IPOP connection among the nodes.
- **Streaming Nodes:** Three Raspberry Pi 3 devices equipped with cameras, streaming live video feeds from three different geographical locations.
- **Processing Node:** An Intel Joule 570x Developer Kit with expansion board to run face recognition on the video feeds. The processing node is the heart of the system which can process several IP cameras at once running an open-source "Home Surveillance with Facial Recognition"[1] application.

The application which itself utilize "OpenFace"[2], one of the most common and accurate open-source face recognition applications, is a low-cost, adaptive and extensible surveillance system. It is focused on identifying for potential home intruders by processing cameras' feeds and distinguishing whether the recognized face is in the face database or not.

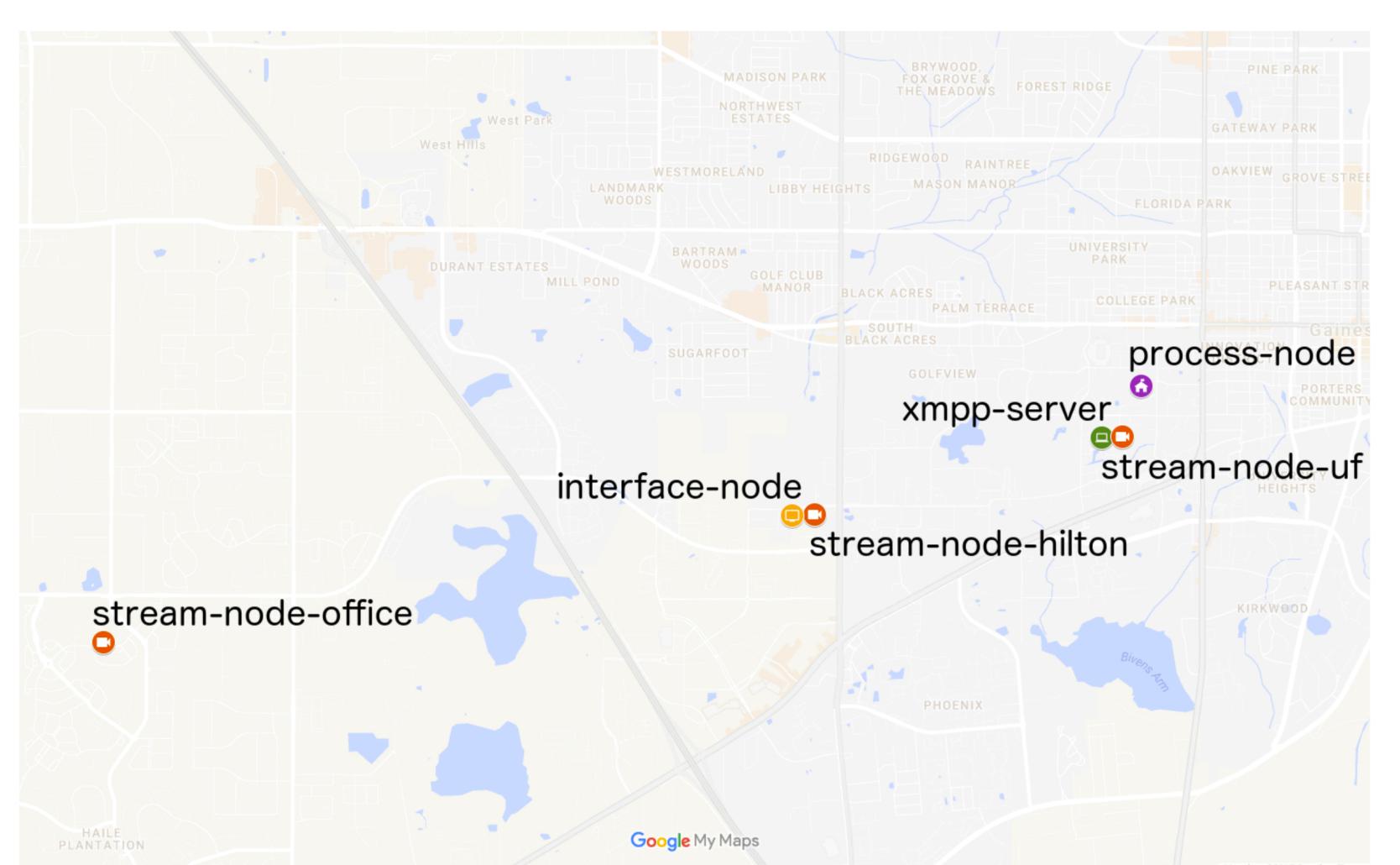
- **Interface Node:** A Raspberry Pi 3 device to load the demo web interface.

[1] https://github.com/BrandonJoffe/home_surveillance

[2] <http://cmusatyalab.github.io/openface>

Geographical Overview

The nodes are geographically distributed, using either wireless or wired network connections and connected to different networks behind NATs and/or firewalls. However, they communicate as if they are on the same network through IPOP VPN.



IoT Hardware Platforms

Raspberry Pi 3 Model B + Camera Module:

The 3rd generation of this world-popular feature-rich credit card sized board empowered by a 64-bit, quad-core processor with wired and wireless connectivity.

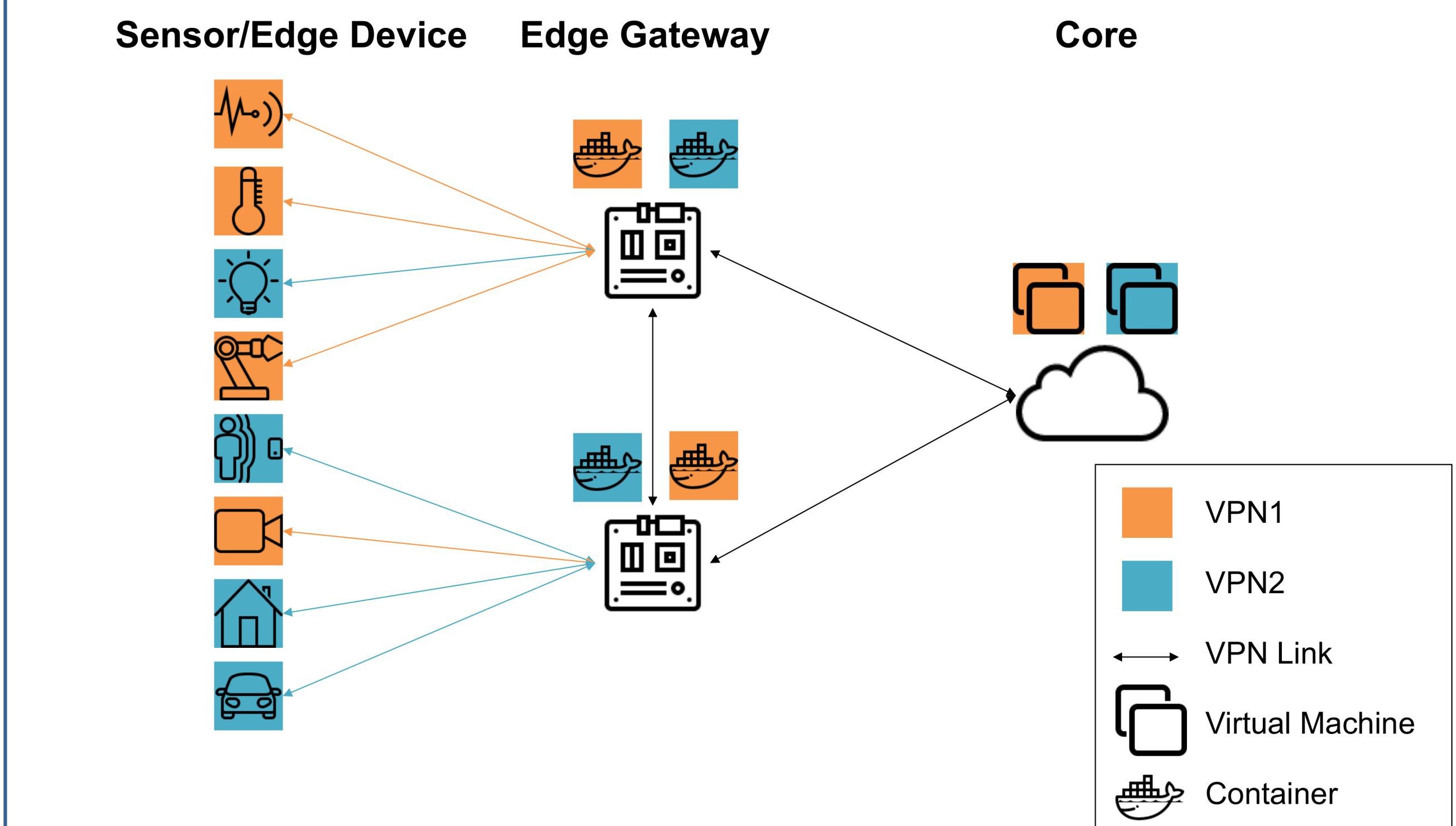


Intel Joule 570x Developer Kit with Expansion Board:

A system on module (SoM) to combine a 64-bit, quad-core processor with power management services, wireless connectivity, and high-speed I/O.



IoT – Edge Analytics



Network Structure

