Privacy-Aware Live Video Analytics

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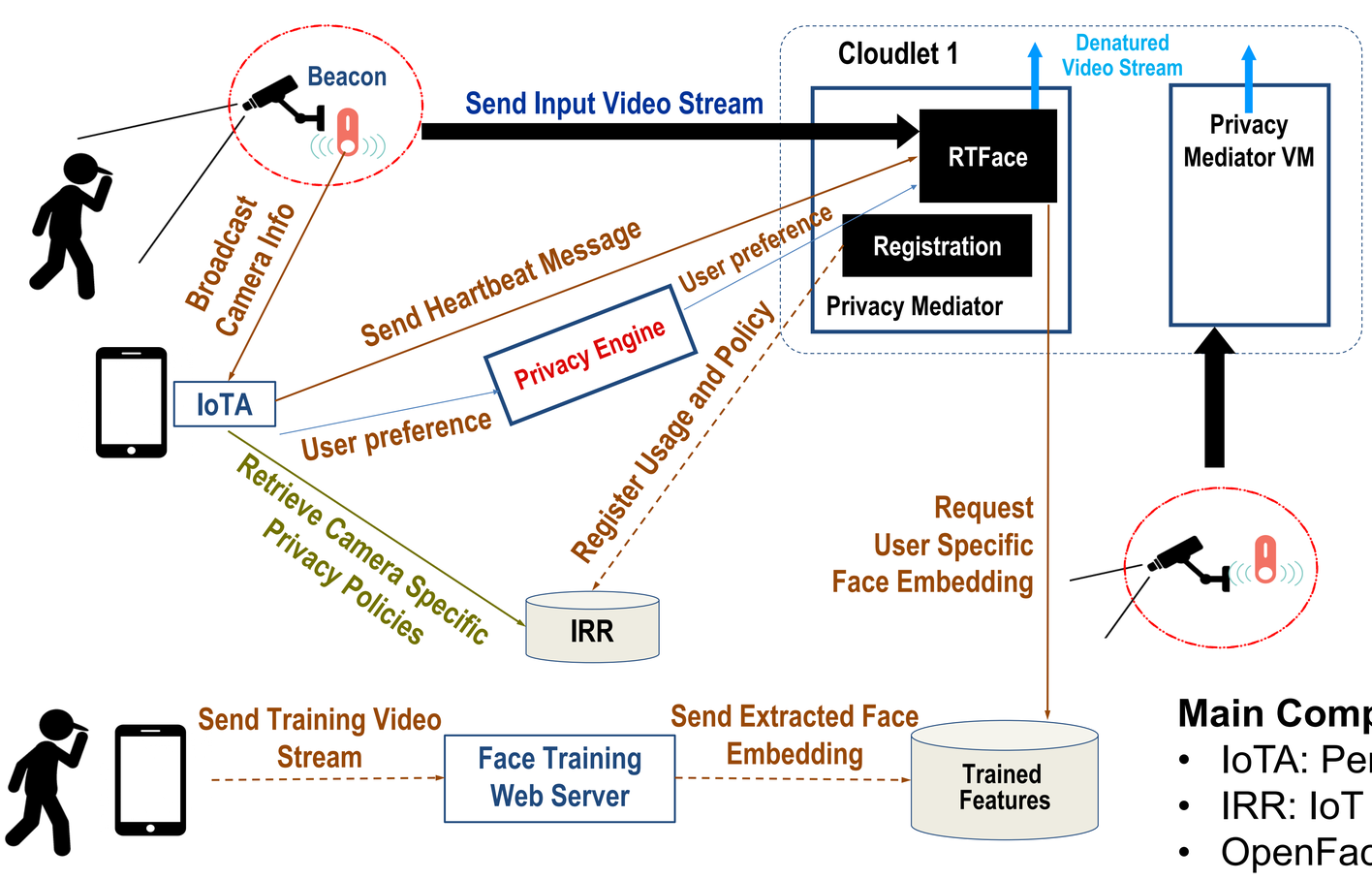
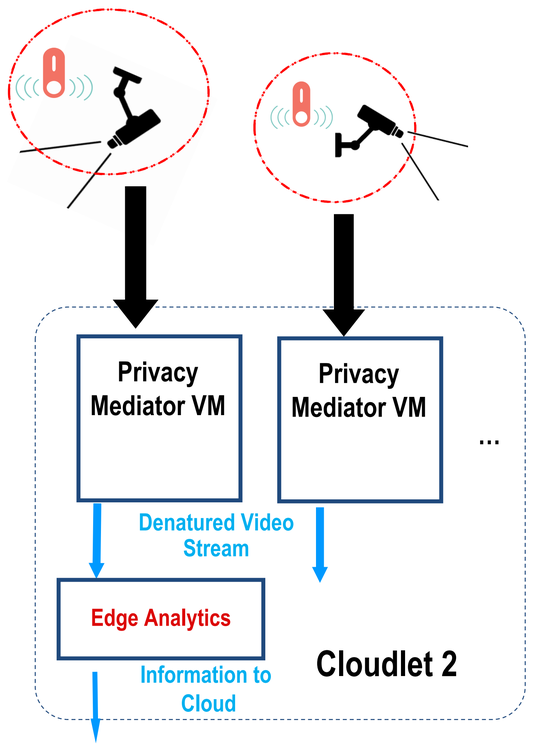
Introduction

The accuracy of facial recognition has seen significant improvement in recent years with the adoption of *deep convolutional neural networks (DNN).* Consequently, we are seeing a growth of commercial applications that are now utilizing facial recognition. For example, Facebook's *Moments* app uses facial recognition to automatically create and share photo albums with friends and family. Theme parks like *Disney* also use facial recognition to automatically group pictures into personalized albums for identified park users.

While users benefit from facial recognition-based applications such applications also impose privacy concerns. This is specially true in the era of IoT as decreasing costs of cameras and computation devices have enabled large-scale deployments of IoT cameras in places such as schools, company workspaces, restaurants, shopping malls, and public streets. Recent studies have shown that users privacy preferences vary with applications and with that in mind we have designed a privacy-aware live video streaming system.

System Architecture

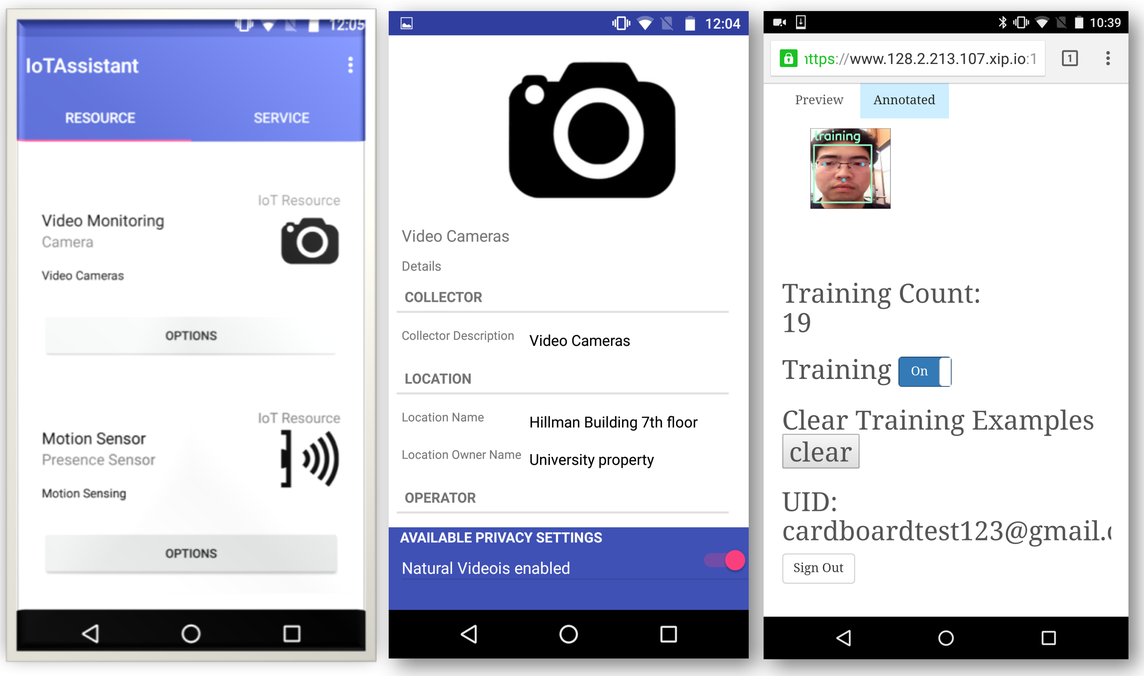




Main Components:

- IoTA: Personalized privacy assistant for IoT
- IRR: IoT Resource Registry
- OpenFace: Real-time face detection system
- RTFace: Image Denaturing Application
- Privacy Engine: Privacy Preference Enforcement Engine

Preference and Face Training



IoTA enables users to lookup nearby services. It also allows users to provide their privacy preferences for different services. To opt-in/opt-out of facial recognition-based applications users have to provide training data to the system.

Demo Setup

- Camera : Raspberry Pi 3 with 8MP 1080p video camera (alternatively laptop/smartphone camera)
- Video Analytic : Browser based multicast streaming application
- IoTA : Android application on OnePlus 2 smartphone
- Beacon: BEEKS beacon advertising IRR

The demo currently works for multiple people in the same image. However, this is still a work in progress as we are trying to improve the facial recognition system to detect face profiles.

About the Project

Carnegie Mellon University

DARPA

Air Force Research Laboratory

www.privacyassistant.org