

# Akhilesh Moghe

Senior Engineering Lead

Mobile: +91-8446140906

Email: [akhileshmoghe@live.com](mailto:akhileshmoghe@live.com)

Linkedin

Personal website

Technical Blogs

stackoverflow

---

*An Agile-Result-oriented software engineer focused on the Architecture, Design and implementation of IoT/Edge device/Cloud applications for devices updates & data management. Successfully delivered 2 IoT projects in last 3.5 years with AWS IoT, Azure IoT, Ayla IoT, Mender.io platforms on ARM, x86 & STM32 devices. Overall, 10 years of IT services & Product development experience in IoT, Cloud & Multimedia domains.*

---

## Software Development:

**Broker Architecture, Client-Server Architecture, Multithreaded-Multiprocessor-distributed Applications, Agile, Test Driven Development, Design Patterns, REST, Service Oriented Architecture**

## Technologies Frameworks:

**NodeJS, Robot Operating Systems (ROS1 & ROS2)**

## Cloud Platforms:

**AWS, Azure, Ayla IoT Platform, Firebase, PubNub, Mender.io**

## AWS Cloud Services:

**AWS IoT, Greengrass, Robomaker, Lambda, Kinesis, API Gateway, SNS, S3, EC2, EKS, IAM**

## Azure Cloud Services:

**Azure IoT Hub, IoT Edge, Device Update, Azure Stack Hub, ML Deployment, Storage, Container**

## Programming Languages:

**C, C++, C++11, Python, JavaScript, Shell Script**

## IoT Protocols:

**MQTT, D-Bus, DDS, ZeroMQ, AMQP, Serial, MAVLink, RTSP, HTTPS**

## Multimedia Formats:

**H264, VP8 codecs, WebM Packetizer, WebRTC Framework**

## Databases:

**MongoDB, MongoDB Realm, InfluxDB, SQLite**

## Build Tools, Continuous Integration, Continuous Deployment:

**Make, CMake, Git, Docker, Kubernetes, Ubuntu Snaps**

---

**Soft Skills:** *Attention to details, Connecting the dots, Analyzing and inferencing, Time Management, Communication, Teamwork, Technical Blogging, Presentation, Effort Estimations*

---

## Experience:

- Senior Engineering Lead at Persistent Systems (Oct 2021 – Present)
- Engineering Lead at Persistent Systems (Jan 2019 – Sept 2021)
- Module Lead at Persistent Systems (Jan 2016 – Dec 2018)
- Senior Software Engineer at Persistent Systems (June 2014 – Dec 2015)
- Software Engineer at Persistent Systems (July 2011 – May 2014)

## Education:

- **Post Graduate Diploma in Embedded Systems and Design**  
Centre for Development of Advanced Computing (CDAC), Hyderabad
- **B.E. in Electronics and Telecommunication**  
Rashtrasant Tukadoji Maharaj Nagpur University

## Projects:

### 1. Edge IoT Framework primarily for Life Sciences Use-cases

➤ **Role:** Solutions Architect (3 Months)

➤ **Accomplishments:**

- Currently evaluating **AWS Outpost, AWS EKS, Kubernetes**, Containerized deployments, **Apache Kafka, Pravega**, Scalable **MQTT brokers** deployment to address high volume sensors, high-definition video data use-cases in **5G Edge Computing** scenarios.
- Worked on common **Edge IoT use-cases**, various possible scenarios considering data flows, data types, data restrictions, privacy, latency, bandwidth consumptions, connectivity restrictions, etc., primarily revolving around Life Sciences projects and devices.
- Evaluated Open-Source Edge Projects such as **KubeEdge, ioFog, EdgeX, LF-Edge** Umbrella projects against identified use-cases.
- Evaluated suitability of **AWS IoT Greengrass** and **Azure IoT Edge** + other **AWS/Azure on-premises services** for various Edge computing scenarios, presented pros & cons of both public cloud platforms and created various possible use-cases architecture/design with AWS/Azure as primary components of framework.
- Architecting a common framework based on open-source Edge projects which can complement the public cloud services in on-premises Edge computing scenarios.

### 2. NVIDIA Jetson Nano based Healthcare IoT Device as a Guided Pipetting Tip Sensing System

➤ **Role:** Systems Engineer (6 Months)

➤ **Accomplishments:**

- Carried out PoC tasks like **flashing boards** to simulate mass flashing at factory.
- Multiple PoCs to understand **customizing RootFS, Secure Boot, Bootloader Splash Screen**.
- Interfacing **Bluetooth module** with NVIDIA L4T BSP software for Jetson Nano. All these PoC tasks resulted in a concrete plan to be executed at factory manufacturing.
- Evaluated, Designed and implemented Firmware update and OS update mechanism based on **Mender-Yocto** Open-Source project.
- Designed and implemented device side **C++ & Python, RESTful** HTTP protocol-based **multiprocessor-distributed** IoT connectivity application for features like device identity & registration, status, user-device association, certificates management, device shadow.
- Evaluated different **inter-process communication** tools, **RPC** mechanisms as **ROS1, ROS2, D-Bus, ZMQ** to Architect & Design multiprocessor-distributed application.

### 3. STM32 MCU based Portable COVID-19 Diagnostic device kit

➤ **Role:** Firmware Developer (4 Months)

➤ **Accomplishments:**

- Designed and Implemented STM32F407 based MCU **firmware** to achieve **USB communication** with Android app using **Virtual COM Port, Flash memory read/write** and **PWM generation**.
- Created a dummy test application in Python to automate the testing of STM32 firmware.
- Received "**Bravo Award**" For the delivering the project in 3 months.
- [Client Received \\$2 Million funding to continue development based on our Project](#)

### 4. OTA Firmware Updates for a STM32 MCUs and full OS Updates for x86 carrier boards

➤ **Role:** IoT Developer (14 Months)

➤ **Accomplishments:**

- Designed and implemented **custom bootloader** with **Dual bank** strategy for STM32F407 MCU to achieve robust Firmware update requirements. **MAVLink** communication protocol and Signature & checksum verification were few of the other key features implemented.
- Designed & developed **C++ & Python** based **multithreaded multiprocessor-distributed** application to achieve **OTA firmware update** for multiple STM32 MCUs. **AWS IoT Jobs, Device Shadow, Secure communication** and UART based serial communication were key features.
- PoC for **full OS image** and **Application update** using **Mender.io** Open-Sorce project. Full OS OTA updates with Mender server hosted on EC2. Also, same kind of updates with USB and over LAN were also achieved with local Python server.
- Evaluated and finalized **Ayla IoT platform** for early market release without full fledge cloud development. Device provisioning, status, firmware updates to multiple devices, sensor data streaming were key features achieved in 4 months duration.
- Designed and implemented a **NodeJS module** for Data Synchronization between device and cloud using **MongoDB Realm** and **MongoDB Atlas** cloud databases. Understanding of new platform and successful delivery was achieved in 3 months.

## 5. Drone-based Asset Inspection with AWS IoT Greengrass & AWS Robomaker Services

➤ **Role:** Robotics, IoT Developer (8 Months)

➤ **Accomplishments:**

- [Demos were successfully showcased at CERAWeek 2019 and AWS re:MARS 2019 events](#)
- [Drone simulation around oil-rig running in background in AWS official Tech Talk](#)
- Understanding of the new to be launched or recently launched **AWS Services** like **Robomaker, Greengrass, AWS IoT** and their use-cases for Robotics projects were achieved in 3 months with demonstratable applications as an outcome.
- **Robotics framework ROS** based **distributed application** had Machine Learning features like Rust and leakage detection models that were deployed with **AWS IoT Greengrass** to multiple devices as **NVIDIA Jetson TX2 (drone)**, mobile robots and x86 machines. **AWS IoT device shadow** updates and **IoT Jobs** for firmware update were also used.
- **AWS Lambda** functions were deployed to AWS IoT Greengrass to run ML inference.
- Robotics application was able to capture and upload the thermal and normal camera videos to **AWS S3** buckets, which were consumed by **AWS Sagemaker** for Machine Learning training.
- **NodeJS, JavaScript** based Web Application running on **AWS EC2** was developed to control Robots with commands, to trigger firmware updates, and to initiate ML training in Sagemaker.
- Camera Live video streams were transmitted to **AWS Kinesis Video Streams** and the same were rendered on Web Application in **HLS format**.

## 6. WebMeeting (Screen Sharing Application) for MAC and Windows

➤ **Role:** Backend Developer (26 Months)

➤ **Accomplishments:**

- Received "[You Made a Difference Award](#)" for the extensive work done in the initial phase of the project, which helped the team to scale up and gain Client's Confidence.
- Understood the **Chromium Open-Source Project** relevant modules, build systems which can be reused to create a **cross-platform** (Windows & MAC) Screen Sharing application which used **VP8 video codec** and **WebM packetizer**. Demonstrated the key functionality of screen sharing in 3 months.
- Evaluated and **AWS S3**, Dropbox, Google Drive for file sharing capabilities, but Client did not pursue another cloud platform and file share was implemented with Firebase & PubNub.

- Designed and developed **HTTP transport module** for screen sharing data + Chats + File sharing modules with **Firestore** & **PubNub** cloud platforms.
- Later, it was developed into a full-fledged product with multiple browsers supports + Chat, file share, recording capabilities. The core screen sharing product is still in production.
- PoC application was developed for **Image & Text Detection** in screen share data using an open-source library.

## 7. Porting WebRTC based GChat Application on Linux & Android Platforms

- **Role:** Backend Software Developer (20 Months)
- **Accomplishments:**
  - The product was successfully showcased in CES2012-13 by the customers.
- **Responsibilities:**
  - Set Top Box, **TI BeagleBone, Panda ARM board** bring up with Linux/Android OS images.
  - Building & Porting **WebRTC** code for different **Linux, Android Set top boxes**.
  - Dealing with all kinds of compile and run-time errors on every platform.
  - Modifying WebRTC GYP build structure for integrating platform specific Codec and Camera Libraries.
  - Integrating **H264 Decoder-Renderer** APIs with WebRTC code.
  - Integrating/Testing Quanta and Maxim Camera modules in the applications.
  - Debugged **H264** Decoder, **YUV-RGB Render** modules for Linux, Android platforms.
  - Thorough Unit Testing & Bug Fixing.

## 8. Robotics Device Management Effort Estimation & Proposal Creation based on Azure Cloud

- **Role:** Developer (2 Months)
- **Responsibilities:**
  - Understand the Product Requirements
  - Understand various **Azure IoT** & other Cloud services and mapping them to Product Requirements.
  - Create an Overview **ROS** & Azure Cloud based **Architecture** using **Docker Container**.
  - Create **Docker Containerized ROS Demo applications** running on x86 Linux machine accessing connected peripheral devices, file system.
  - Create **complexity sheet** with various modular tasks to arrive at an **effort estimation**.
  - Coordinate with other Product teams involved.