Supported with interoperable ecosystem of plug-and-play components

Mainflux IoT Edge Gateway Series

Developed on Solid Run HummingBoard Carrier Board for iMX6 SOM

Dedeveloped to meet the B2B market demand for a high performance with a whole set of features

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MFX-1 IoT Edge Computing Gateway Series

IoT gateways developed on the optimized hardware platform for edge computing solutions

Introduction

MFX-1 IoT Edge Gateways comes in two basic versions regarding software implemented on the hardware,

1) **MFX-1 Mainflux IoT Platform based gateway**

2) **EGFX-1 EdgeX Foundry platform based gateway**

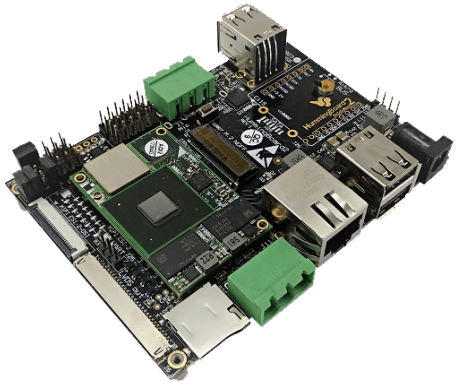
Both versions are implemented on the Solid Run HummingBoard CBi - Edge hardware platform, developed to meet the B2B market demand for a high performance with a whole set of features presented in the table below:

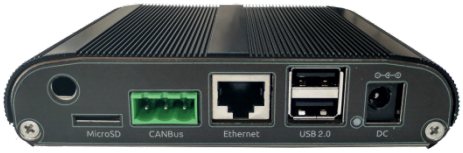
MFX-1 Hardware General Features

Low memory footprint (RAM)	Based on NXP's iMX6 Solo to Quad Core
Small size binaries	CAN bus and RS-485 connectors
Low Latency	Industrial Temp. (-40° to 85° C)
Hi Performance	Physical radio connectivity: WiFi, BLE
Deploy only microservices you need for the project	Cellular connectivity: GSM/GPRS/LTE/CAT-M/NB-IoT, LoRa, 6LoWPAN/Zigbee

Solid Run HummingBoard Edge - System Specification

SOM Model	NXP i.MX6 based Solo to Quad Core SOM
Processor	i.MX6 Solo – Quad core ARM Cortex A9 up to 1.2Ghz
Memory and Storage	Up to 2GB DDR3 uSD eMMC (8GB) M.2 (2242)*
Network	1 x RJ45
Connectivity	1 x CAN bus 1 x RS485 4 x USB 2.0 Mini PCIe M.2 SIM card slot
Media	LVDS MIPI-DSI MIPI-CSI-2
I/O	1 x Reset button 1 x Configurable push button 3 x LED indicators RTC IR reciver
Power	7V – 36V wide range
OS Support	Linux Kernel 4.4x
Dimensions (WxL)	102mm x 69mm
Environment	Optional Metal Enclosure





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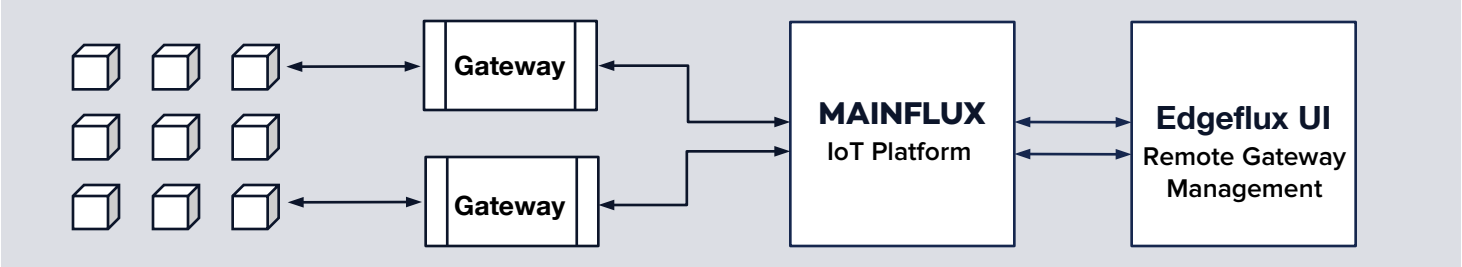
How It Works

Mainflux IoT Edge Gateways works within system which consist of following components:

1) Devices - Sensors and actuators
2) IoT Edge Computing Gateway - MFX-1 Mainflux IoT Platform or EGFX-1 EdgeX Foundry based gateway
3) Mainflux IoT Core Platform – Open-source patent – free IoT Platform
4) EdgeD - A Linux daemon responsible for the Control Plane of the gateway
5) Edgeflux - A system for remote device and gateways management

Mainflux IoT Core Platform and Edgeflux – Gateway Remote Management

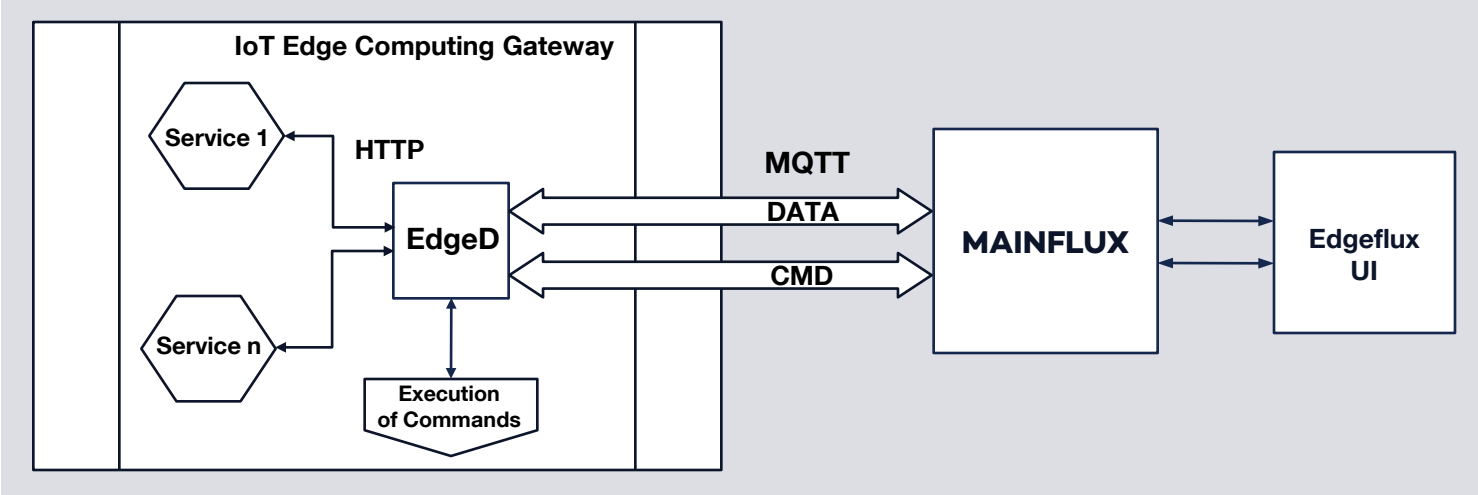
Mainflux IoT Core Platform accepts connections from the gateways on the south side. Each gateway has 2 dedicated channels (at least). On the north side, Mainflux is connected to Edgeflux app, and serves as a middleware (messaging bridge) between Edgeflux (in the cloud) and thousands of remote gateways in the field. Mainflux has several important roles: Control plane communication - commands for gateway management Data plane communication - data acquisition and storage Bootstrapping - initial gateway config.



Edgeflux is an application built on the top of the Mainflux open-source and patent-free IoT Platform, which is used internally as the main engine for device management and it is invisible/transparent to the end-user. Edgeflux works as a separate product meaning that all data can be pushed to the other IoT platforms.

EdgeD - Linux Daemon Agent – Gateway Remote Management Enabler

EdgeD is a Linux daemon agent that runs on the remote gateway and connects to Edgeflux in order to enable remote management, monitoring and alerting and the Control Plane of the gateway. It is subscribed via MQTT to Mainflux IoT Core Platform on the CMD channel. It gets commands from Mainflux., executes them on the gateway and returns responses to Mainflux.



Mainflux - MFX-1 IoT Edge Gateway

IoT gateways developed on the optimized hardware platform for edge computing solutions

Mainfux IoT Platform IoT Edge Gateway

Edge computing solution based on Mainflux IoT open-source platform, enebles unified Cloud/Egde IoT technology with gateway and device managament system.

Mainflux IoT platform acts as a multi-protocol data brokering platform, which can internally bridge different protocols and make applications and devices speaking between themselves. It is capable of distributing and delivering data from the machines to different applications and analytics/ML engines and vice-versa.

Centralized Mainflux instance (in the cloud) provides remote device and gateways management which ensures the secure and proper functioning of multiple IoT devices and gateways.

Unified IoT Cloud/Edge Computing System

Mainflux IoT Platform implemented on the optimized Edge Gateway hardware, creates with a centralized Mainflux IoT instance in the cloud an unfied comprehensive full turn-key IoT system.

This unified Cloud/Edge Computing System provides comprehensive spectrum of robust and scalable capabilities and functionalities for development of the most demanding and complex IoT solutions, projects and products.

Mainflux IoT Platform Features

Open Source & Patent Free Apache 2.0 license. Transparency, control, community testing, support and bug fixes. No vendor lock and client access licenses issues.	**Secure** Mutual TLS Authentication (mTLS) using X.509 certificates. NGINX reverse proxy for security, load-balancing and termination of TLS and DTLS connect.
Performant Thanks to Golang language, and microservices **Scalable and Responsive** Microservice-based architecture, built using open-source technologies resulting in high-performance, scalability and fault-tolerance.	**Protocol and Device Agnostic** Multi-protocol support and hardware agnostic. Connectivity for any device PUB/SUB multiprotocol messaging bridge (HTTP, MQTT, WebSocket, CoAP) **Scale Down - Deployable** Deployable from multi-datacenter scale to RPi devices.
Low Opex Low operating expense (OPEX) due to design and selection of core technologies	**Remote IoT Devices & Gateways Management** Ensures the secure and proper functioning of multiple IoT devices

EdgeX Foundry - MFX-1 IoT Edge Gateway

IoT gateways developed on the optimized hardware platform for edge computing solutions

EdgeX Foundry Platform IoT Edge Gateway

Edge computing solution based on LF EdgeX Foundry open source framework that offers interoperable ecosystem of plug-and-play components for faster deployment of IoT solutions.

EdgeX Foundry is an open source framework for edge computing hosted within a full hardware and OS-agnostic reference software platform that unifies the marketplace and accelerates the deployment of IoT solutions.

LINUX FOUNDATION COLLABORATIVE PROJECTS EDGE X FOUNDRY™

Over 75 member companies across the IoT space including Dell, AMD, Analog Devices, Toshiba, Samsung , VMware and Intel.
Project objective: Build a vendor-neutral, flexible, highly-scalable and industrial-grade open source edge software platform supported by a rich ecosystem of plug-and-play components.

EdgeX Foundry Platform Software Features

Interoperable Ecosystem: Makes it easy to integrate service offerings from many sources into a unified IoT edge	Integrating: Unifies existing standards with proprietary solutions
Security: A pluggable unified security model that makes secure solutions development easy in any context.	Generative: Creates a marketplace/ecosystem of plug- and-play components to quickly scale up or down fueling higher-level market innovation
Scalable: Builds on industry models-IIC, OpenFog, OCF	Performant versions without requiring architectural changes
Enables rapid deployment without technology lock-in	

EdgeX Foundry - MFX-1 IoT Edge Gateway

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Mainflux Labs Licensing

Mainflux IoT Core is the open-source, patent-free version of Mainflux IoT platform, published under Apache 2.0 License. Mainflux IoT Core can be downloaded from GitHub for free in a source-code version, or from the DockerHub in the form of Docker containers.

Mainflux Edgeflux and EdgeD - Linux Daemon Agent, are proprietary products delivered to a customer in a binary form and under legal conditions defined by the subscription contract.

These proprietary products are licensed to a customer in the form of a monthly or annual subscription. Mainflux subscription follows unburdening and industry-proven pay-as-you-go" model, in which subscription can be terminated by the customer at any time.

Mainflux Edgeflux and EdgeD Usage Conditions

1)	It comes in two forms: monthly and yearly.
2)	Software is provided in a binary form or in the form of Docker images.
3)	Subscription license does not allow copying and multiplication of provided binary code.
4)	No source code can be provided.
5)	The license is valid per ONE deployment. Discounts are offered on multiple deployments.

Contact Mainflux Labs

Solving Internet of Things Complexity

Mainflux is a technology company providing full-stack, open-source IoT platform, IoT edge computing gateway and consulting services for all IoT technology stack layers.

Technically diverse our cross-functional team covers hardware expertise, embedded-software development, IT operations and management, software and web application development, distributed systems, data science and blockchain development.

From the initial phase and strategic planning, PoC stage, to data analytics after rollout, we are providing professional services and support to ensure success of your IoT development.

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