



MAINFLUX

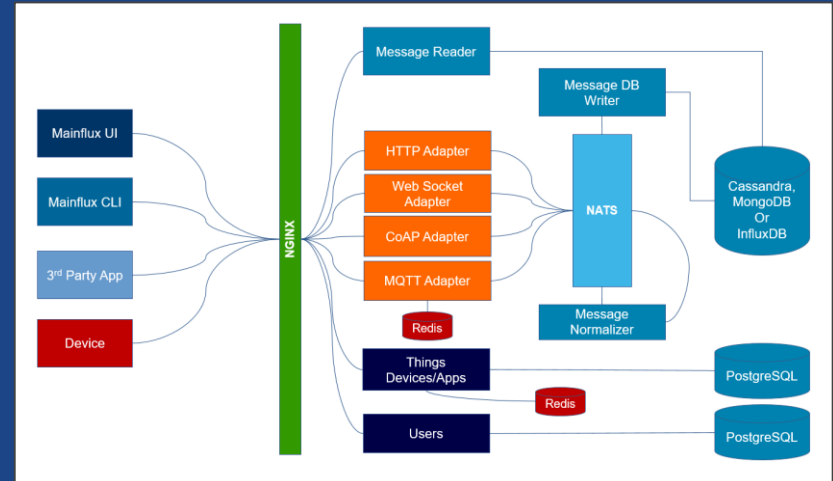
Open Source Internet of Things Technology & Consulting Services

Technology Overview – IoT Fuse 2019
Part 4

MAINFLUX

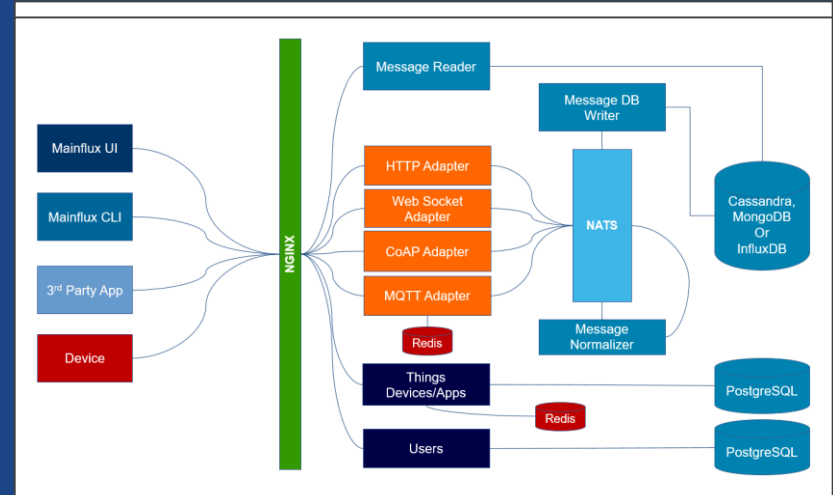
Add-ons:

- Bootstrap Server
- LoRaWAN Server
- Mainflux Edge



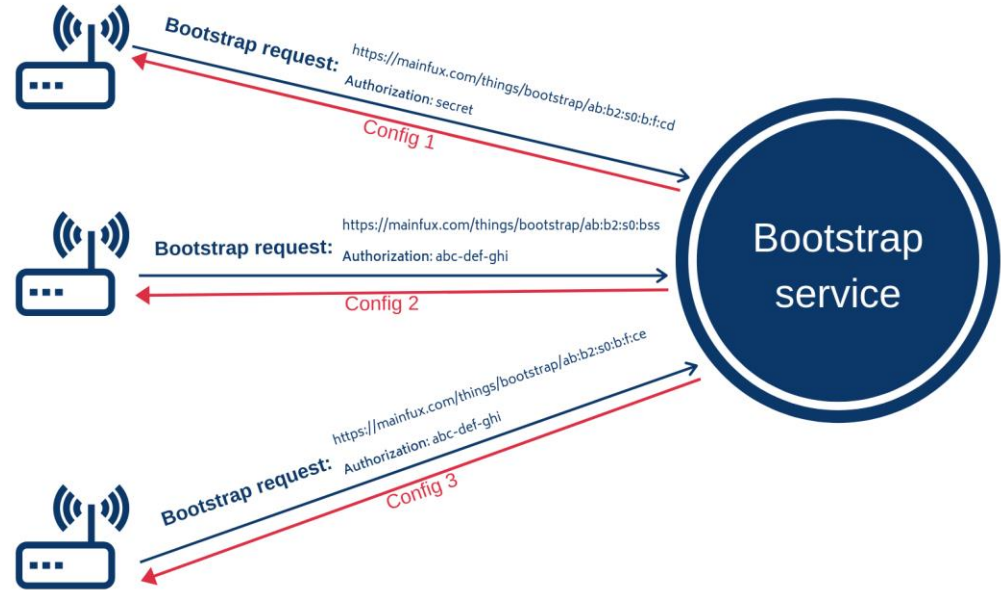
MAINFLUX

Bootstrap Server



- Create channels
- Create things
- Upload thing configuration to bootstrap server
- On the first connect to the bootstrap server the thing picks-up the configuration and connects to Mainflux

Step 3: Bootstrap



MAINFLUX

LoRaWAN Integration



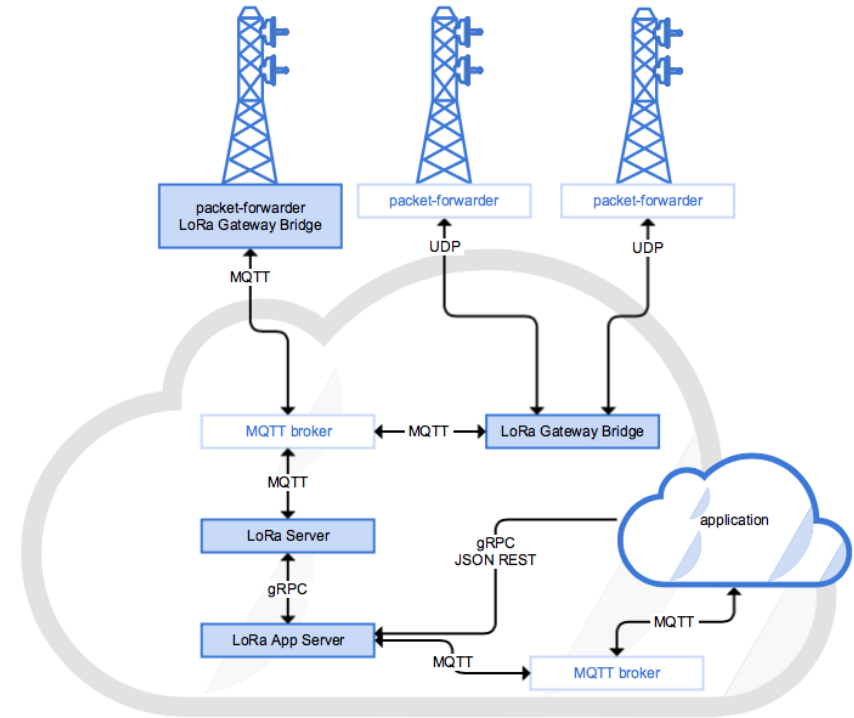
MAINFLUX - LoRa Server - Control Plane Integration

The LoRa Server project (<https://www.loraserver.io/>) provides open-source components for building LoRaWAN networks.

All components are licensed under the MIT license and can be used for commercial purposes.

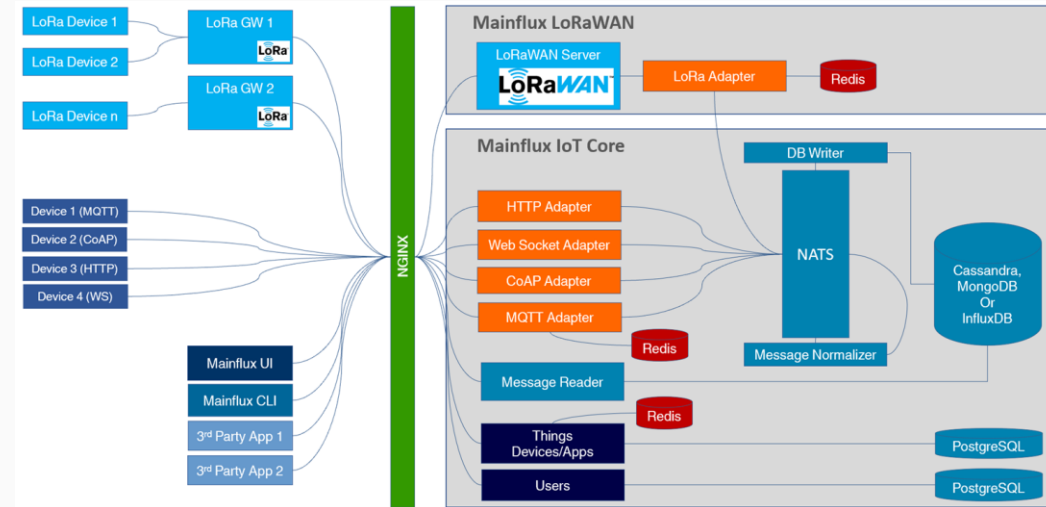
LoRa connected devices to send messages to Mainflux and receive messages and commands from Mainflux

Mainflux IoT Core will act as the master in this system and will be responsible for provisioning of LoRa gateways and LoRa devices. LoRa server will act as the slave and will receive the commands from Mainflux IoT Core through Mainflux LoRa Adapter.

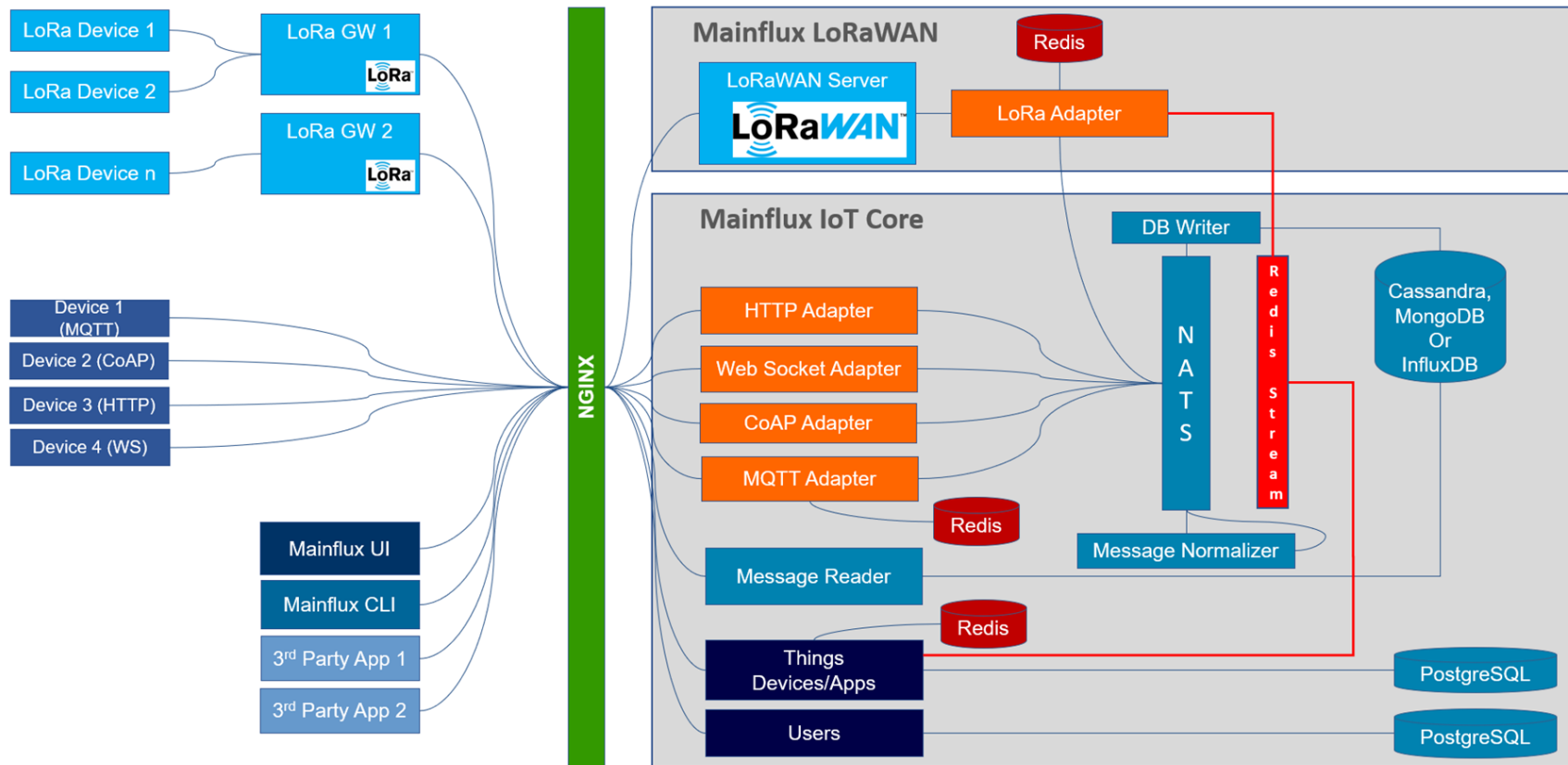


This means that Mainflux will be able to work with data from:

- LoRa devices
- MQTT connected devices
- HTTP connected devices/apps
- CoAP connected devices
- WebSocket connected Apps/devices



MAINFLUX - LoRaWAN Integration



←

LoRaServer

🔍

Search organization, application, gateway or device

?

admin

☰

Network-servers

📶

Gateway-profiles

📅

Organizations

👤

All users

Mainflux-Organization

▼

⚙️

Org. settings

👤

Org. users

👥

Service-profiles

📱

Device-profiles

📶

Gateways

📄

Applications

📡

Multicast-groups

Applications

+ CREATE

ID	Name	Service-profile	Description
3	Mainflux-Application	Mainflux-Service-Profile	Mainflux app 1
4	mainflux-binary	Mainflux-Service-Profile	binary_codec_pysense

Rows per page: 10 ▼ 1-2 of 2 < >

Mainflux - LoRa Device Provisioning



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Mainflux

Dashboard

Management

LoRa

Devices

Applications

Route Map

Provisioning Server

admin

Things

➤ UPLOAD PROVISIONING CSV

⌂ CONNECT

⌂ DISCONNECT

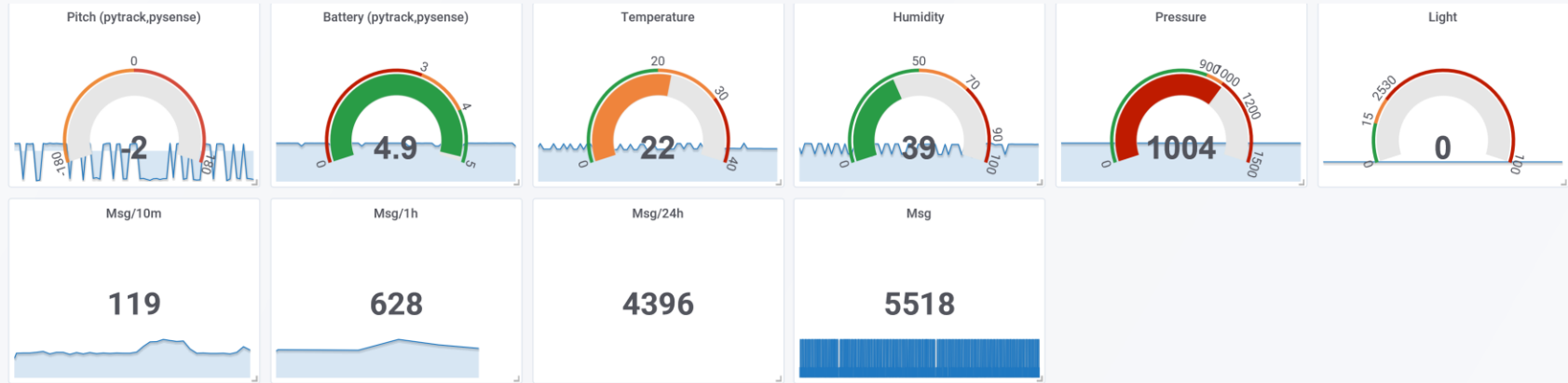
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Made with ♥ by Mainflux

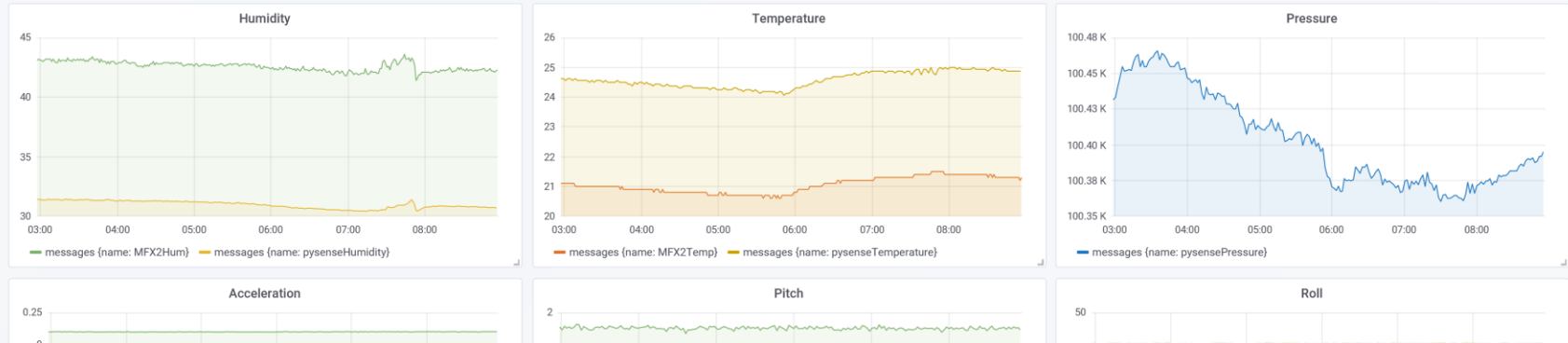
Dashboard with LoRa Sensor Data

Mainflux - Lora ▾

📊 ☆ 🔄 📄 ⚙️ 🔍 ⏪ ⏩ ⌚ Last 6 hours ↺

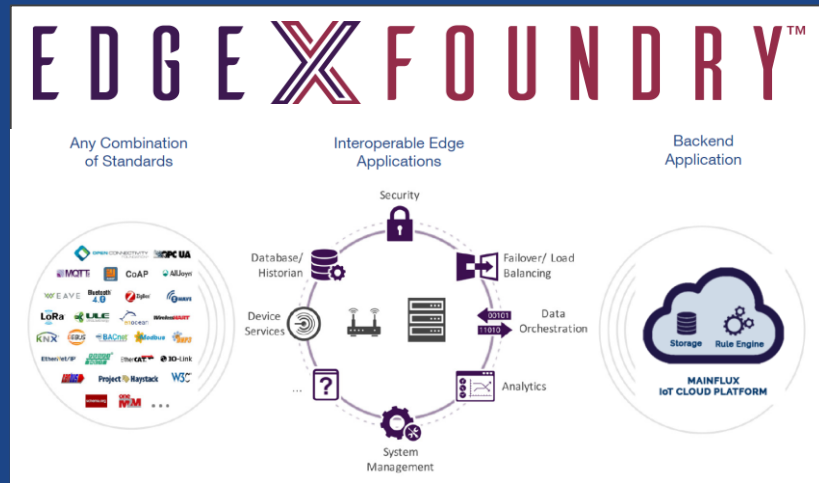


▼ Detailed Dashboard

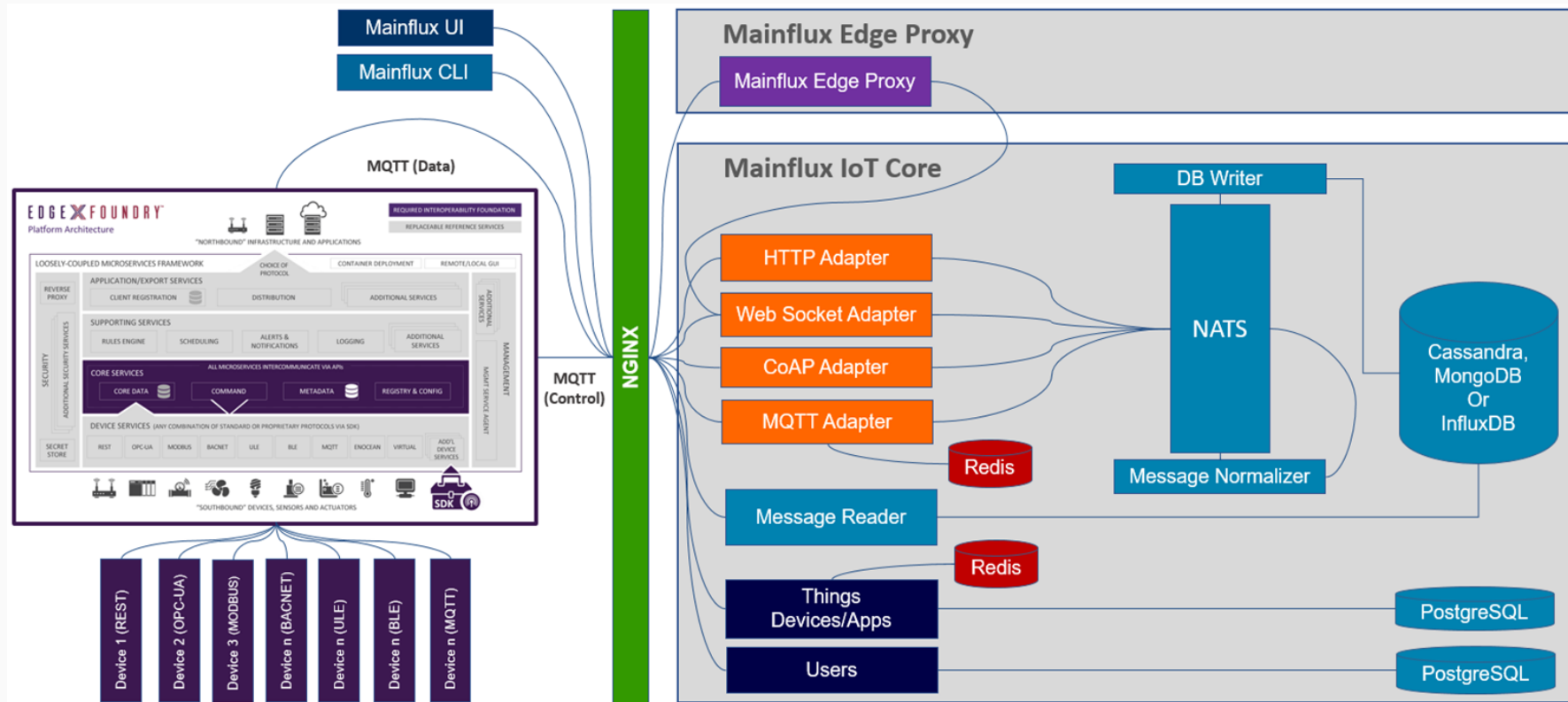


MAINFLUX Future Plans

EdgeX Foundry Integration

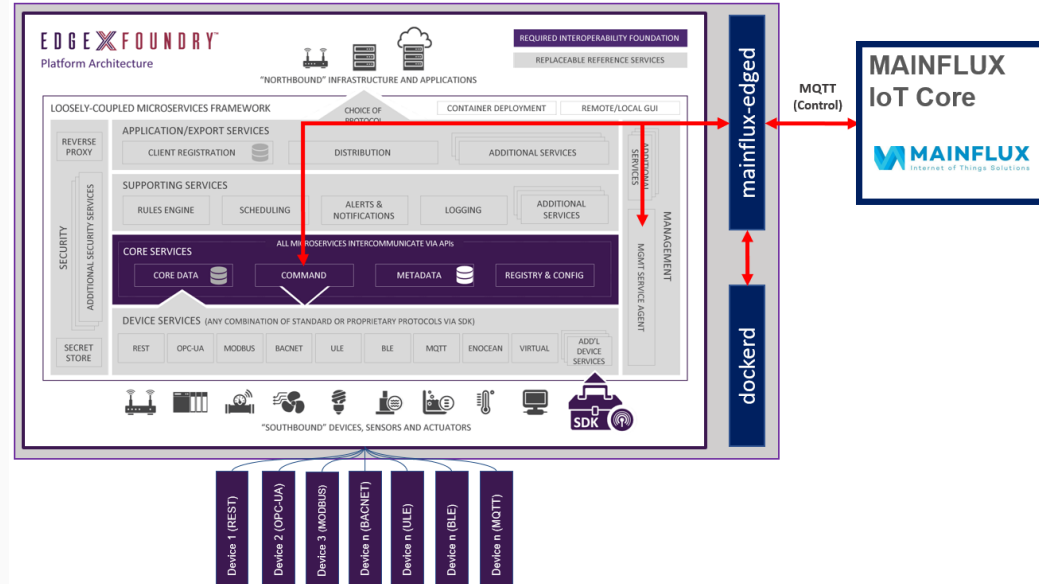


MAINFLUX - EdgeX Integration



MAINFLUX - EdgeX Foundry - Control Plane Integration

- Mainflux is integrating EdgeX Foundry as the edge solution for Mainflux IoT Platform.
- Mainflux will be able to manage multiple EdgeX systems
- Remote Management is done using MQTTS over public internet, no VPN is required
- Mainflux will be able to push applications in docker containers to remote gateways
- Manage Remote:
 - Docker Service
 - EdgeX System Management Service
 - EdgeX Command Service

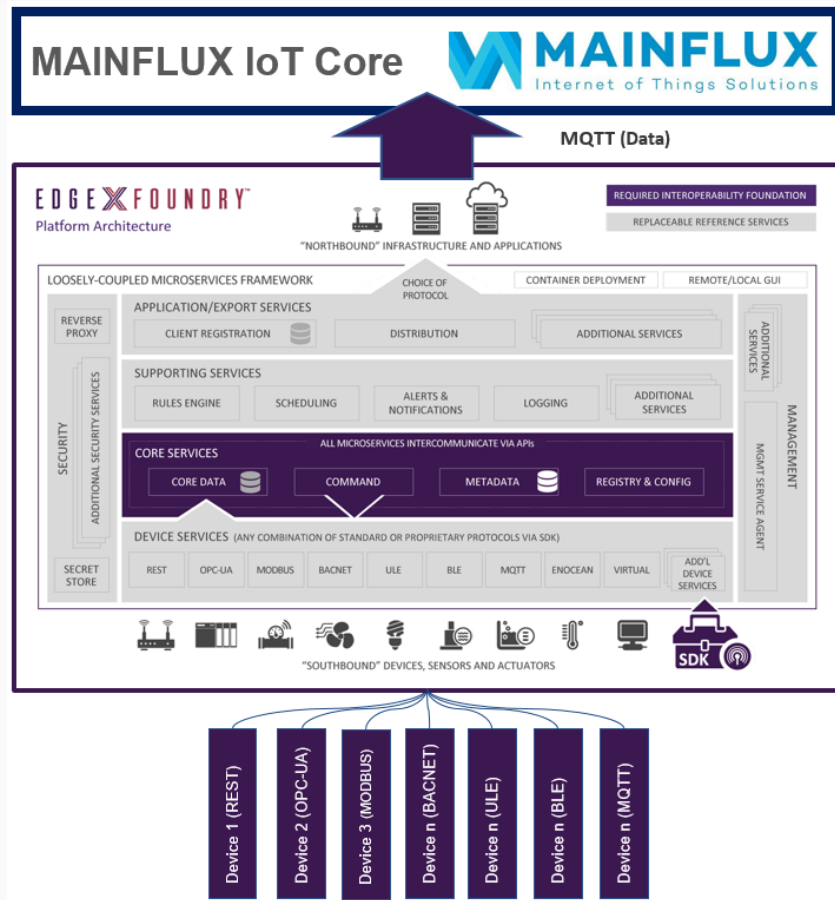


MAINFLUX - EdgeX Foundry Control Plane Integration

Mainflux is be able to receive messages from EdgeX Foundry Systems using MQTT protocol

Once full integration is finished, Mainflux will be able to work with data form:

- MQTT connected devices
- HTTP connected devices/apps
- LoRa devices
- CoAP connected devices
- WebSocket connected Apps/devices
- OPC-UA devices
- BACNET devices
- MODBUS devices
- BLE devices
- ULE devices
- etc..



Go vs Java - Tests done by DELL within EdgeX Foundry



Release Metrics (Jim White a Senior Software Architect at Dell) This test compares identical microservices developed in Java versus Golang.

Linux	Footprint			Container			Memory used no load			Memory used VDS			Memory used heavy load		
	in MB			in MB			in MB			in MB			in MB		
Micro service	Java	Go	Reduction	Java	Go	Reduction	Java	Go	Reduction	Java	Go	Reduction	Java	Go	Reduction
Meta data	51.8	9.4	82%	137	13.8	90%	237.5	3.6	98%	258.4	6.8	97%	283.4	7.9	97%
Core data	56.5	14.9	74%	142	19.6	86%	239.0	2.4	99%	244.1	5.4	98%	260.0	5.9	98%
Command	46.4	7.5	84%	131	11.8	91%	185.0	1.7	99%	185.9	2.0	99%	234.1	5.7	98%

	CPU Usage		CPU under load		Startup Time			Response ping request			Response Get request			Response Post request		
Linux					in seconds			Response in milliseconds			Response in milliseconds			Response in milliseconds		
Micro service	Java	Go	Java	Go	Java	Go	Reduction	Java	Go	Reduction	Java	Go	Reduction	Java	Go	Reduction
Meta data	3.8%	0.1%	81.3%	7.0%	37.3	0.36	99%	14.6	10.9	25%	38.2	24.4	36%	18.7	39.8	-112%
Core data	4.7%	0.1%	40.3%	8.3%	37.5	0.44	99%	14.5	7.9	45%	217.5	222.0	-2%	39.0	66.5	-70%
Command	2.8%	0.1%	84.9%	2.0%	27.1	0.27	99%	16.9	7.5	56%	259.4	28.7	89%			

Results clearly indicate Golang as more performant and efficient as measured by number of factors above.

Note: Due to recently discovered Meltdown and Spectre hardware vulnerabilities software performance is expected to be reduced significantly via necessary software patching thus emphasizing the need for efficient application code.

Spreadsheet is available at: [Wiki](#)
EdgeX Foundry

MAINFLUX - MFX-1 IIoT Gateway

Mainflux MFX-1 Edge IoT gateway hardware is in development.

Engineering Sample is part of EdgeX Demonstrator Kit

Mainflux received the grant from Serbian Innovation Fund to develop the hardware IoT gateway based on EdgeX Foundry.

Based on ARM32 Architecture

SolidRun Hardware

HummingBoard Edge	
SOM Model	i.MX6 based Solo to Quad Core SOM
Memory and Storage	Up to 2GB DDR3 uSD eMMC (8GB) M.2 (2242)*
Connectivity	1×RJ-45** 4×USB 2.0 mPCIe with SIM card holder
Media	HDMI-Out MIPI-CSI-2 and MIPI-DSI Parallel Camera (on GPIO header) LVDS Analog Audio
I/O	Reset Button 36 pins GPIO Header RTC with battery IR
Power	7V-36V, 5.5mm in (Twist and Lock mechanism)
Software	Linux
Dimensions (WxL)	102mm×69mm
Enclosure	Optional Metal Enclosure

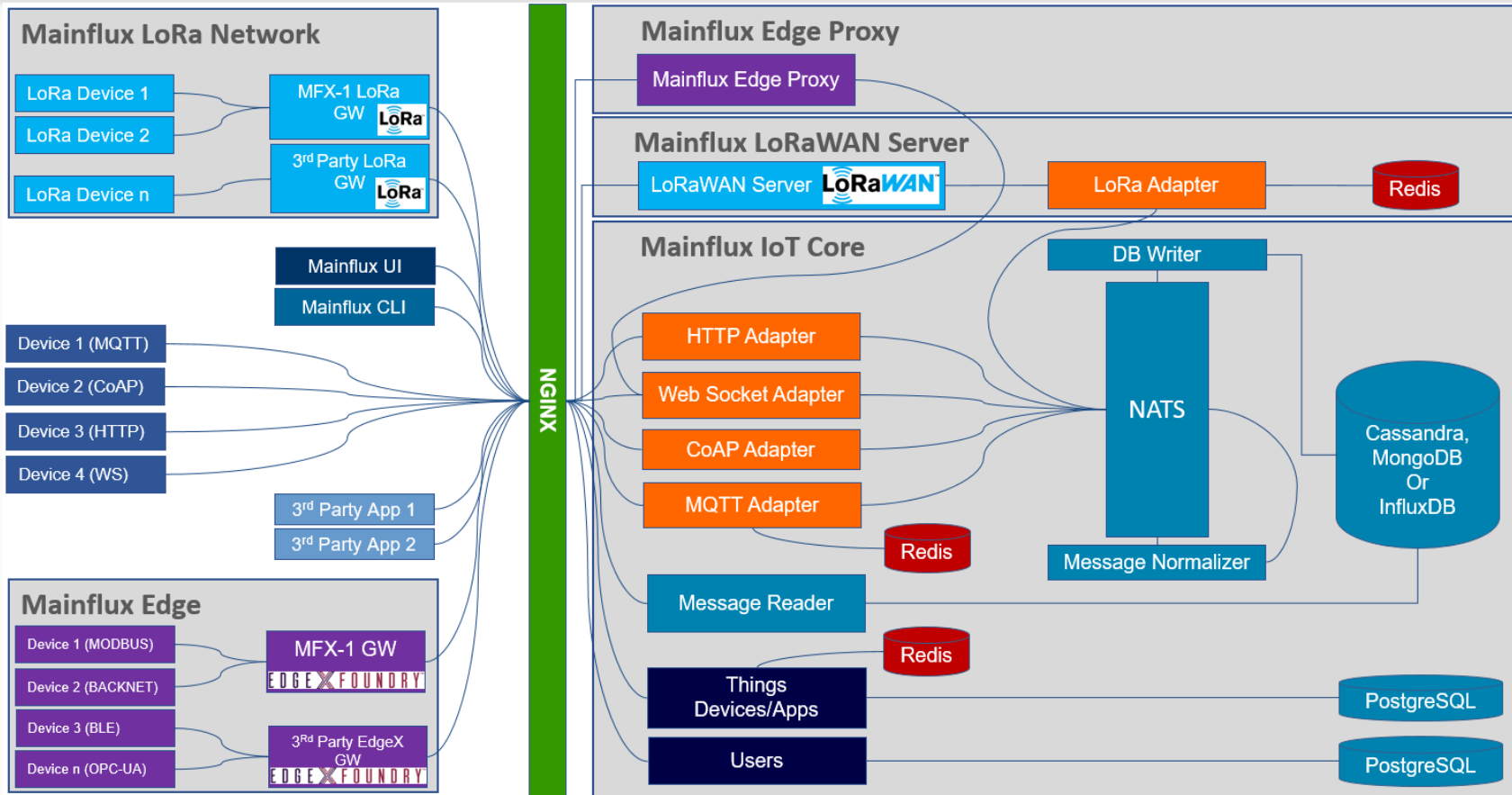


MAINFLUX

Complete IoT Platform



MAINFLUX - Mainflux IoT Core + Mainflux LoRa + Mainflux EdgeX



MAINFLUX

Road map



2019 - Q1:

- EdgeX Integration
- Mainflux MFX-1 IoT Gateway
- Data Analytics White Paper

2019 - Q2

- Certificates for Authorization
- Data Analytics Demo

2019 - Q3

- Mainflux 2 Mainflux Communication
- Data Analytics

MAINFLUX

OPEN SOURCE IoT PLATFORM

Getting started with Mainflux open source IoT platform

Platform installation and initial configuration

Message exchange examples



THANK YOU!

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info@mainflux.com