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China 2019

Integration of Edge and Cloud IoT Platforms

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Authors

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Drasko Draskovic

Mainflux CEO & Founder

Drasko is the founder of Mainflux IoT open source project and member of TSC in EdgeX Foundry Project

Drasko is an IoT expert with over 15 years of professional experience. He hacked embedded Linux SW and HW device drivers, designing complex wireless systems in telecom industry.

He holds MSc. In Telecommunications.

Janko Isidorovic

Mainflux COO & Co-founder

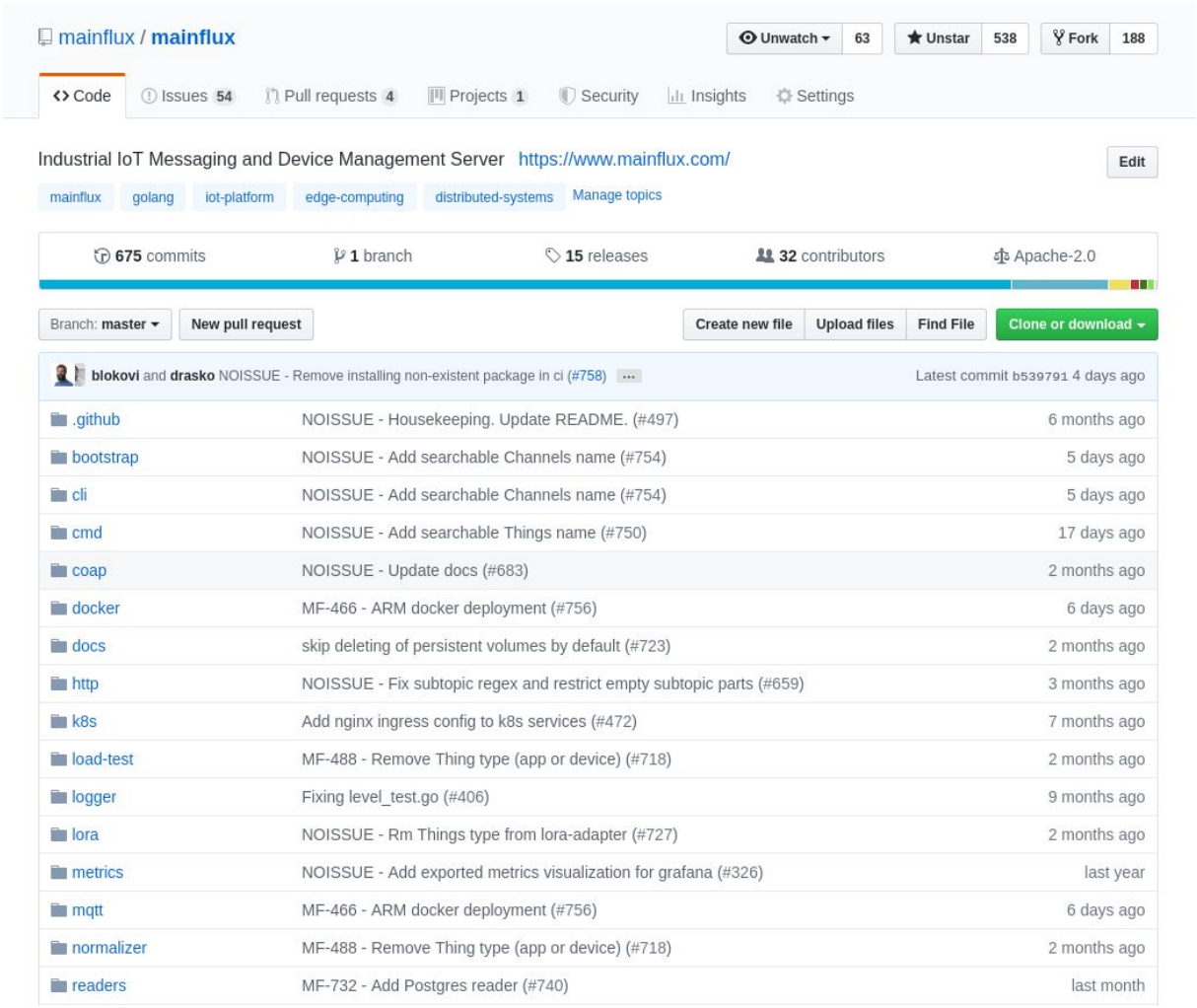
Janko is the co-founder of Mainflux IoT open source project.

He is also chair of the Application Work Group of Linux Foundation EdgeX project.

Janko has a 10+ years background in Project Management, IT and Software integrations.
He holds MSc. In Telecommunications.

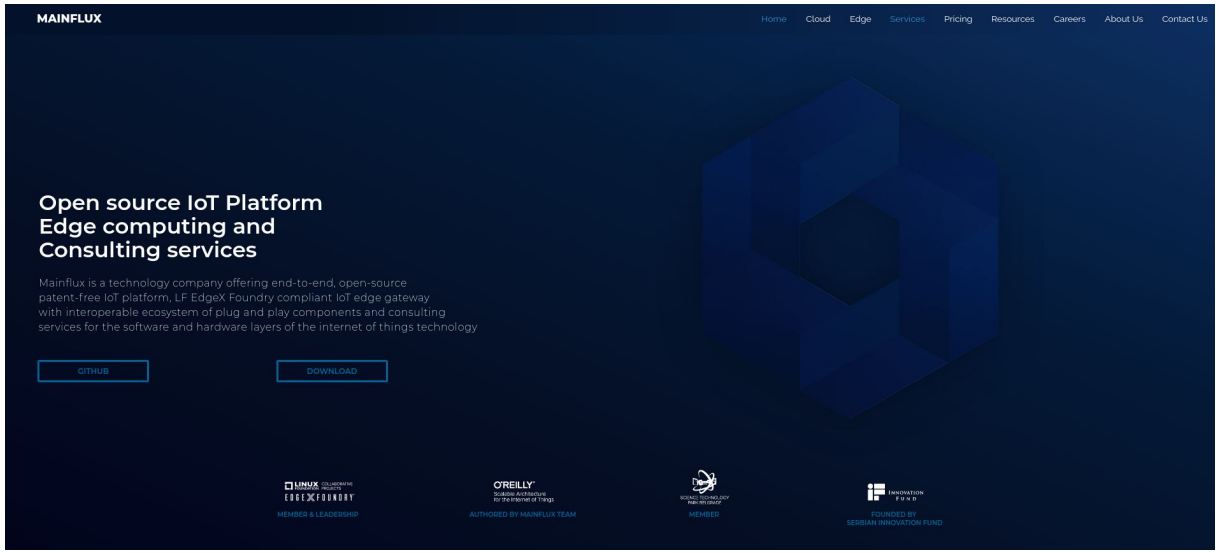
Mainflux Project

- https://github.com/mainflux/mainflux
- Open-Sorce, Apache-2.0 licensed, patent-free
- Over 30 contributors
- Written in Go
- Docker & Kubernetes
- Used in production



Mainflux Labs

- https://www.mainflux.com/
- Professional services around Mainflux IoT Platform
- Clients are big companies in the domain of Oil&Gas, Retail, Telecom, Semiconductor...
- MFX-1 IoT gateway with EdgeX Foundry SW
- Edgeflux gateway management SaaS
- Docker & Kubernetes
- Used in production

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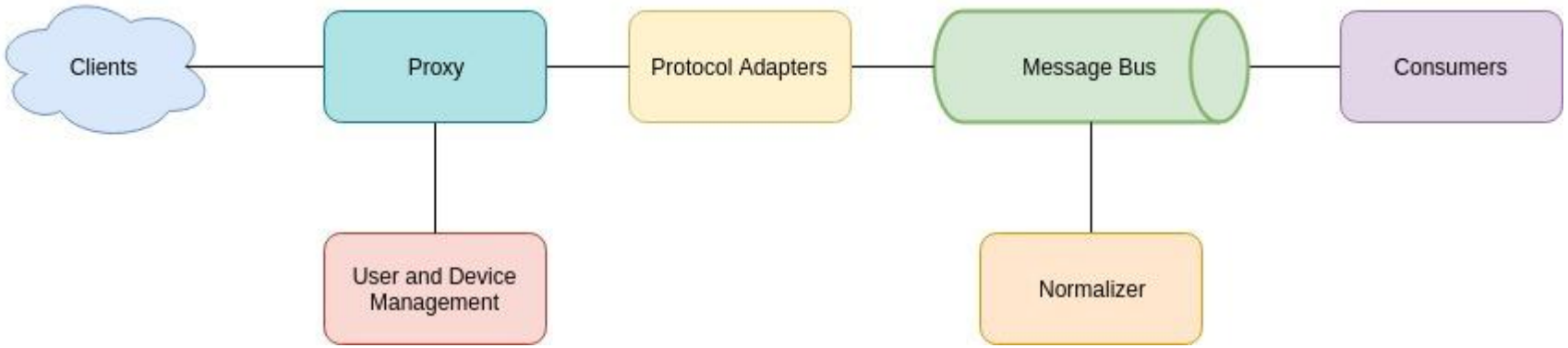
Cloud

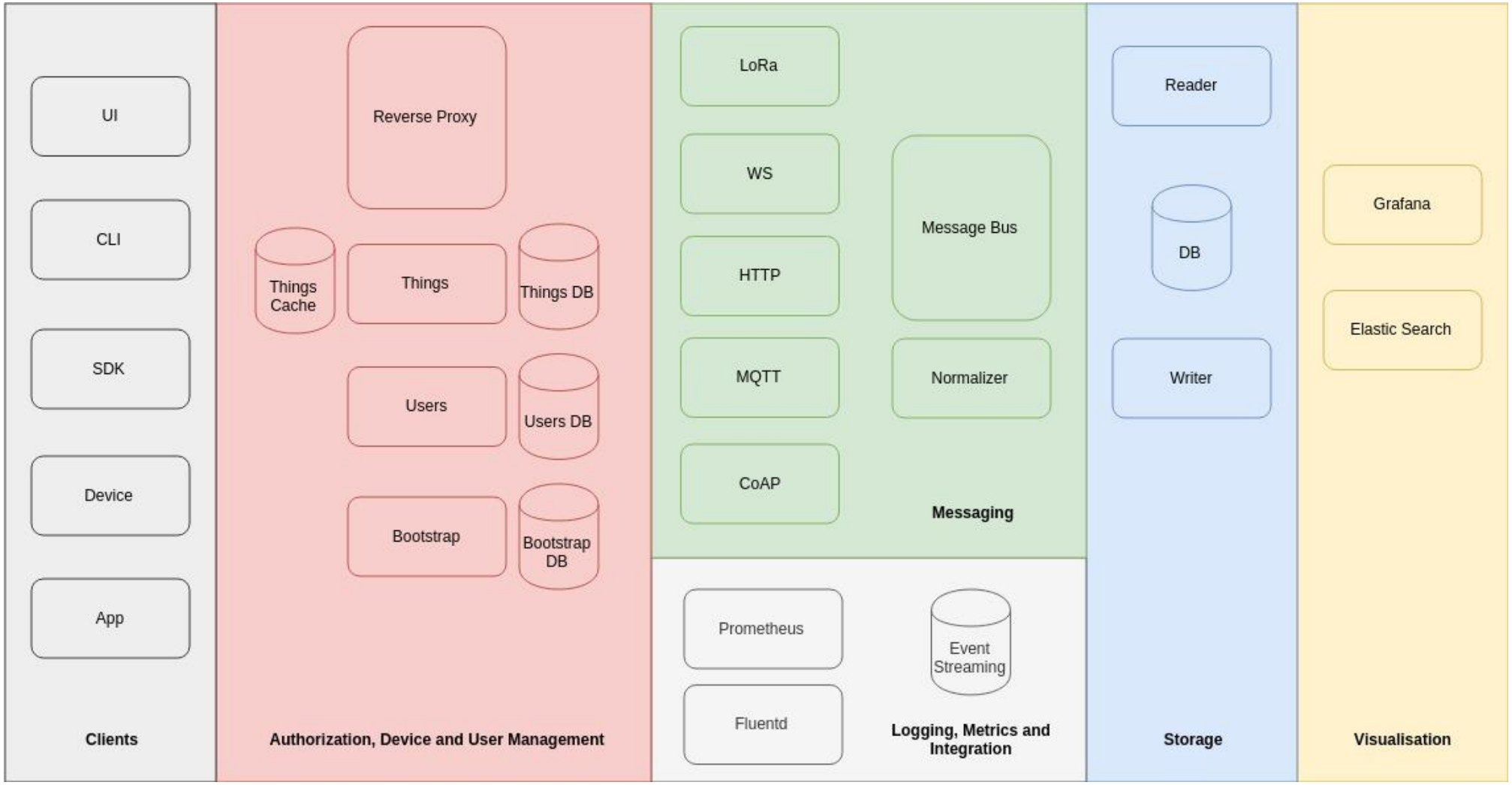
Mainflux - Overview

- Microservice Architecture
- Golang wherever possible - Go Kit
- NATS Message Bus
- NginX
  - TLS/DTLS Termination
  - Reverse Proxy for UI
- SQL database for structured data
- NoSQL database for Telemetry:
  - InfluxDB
  - MongoDB
  - Cassandra

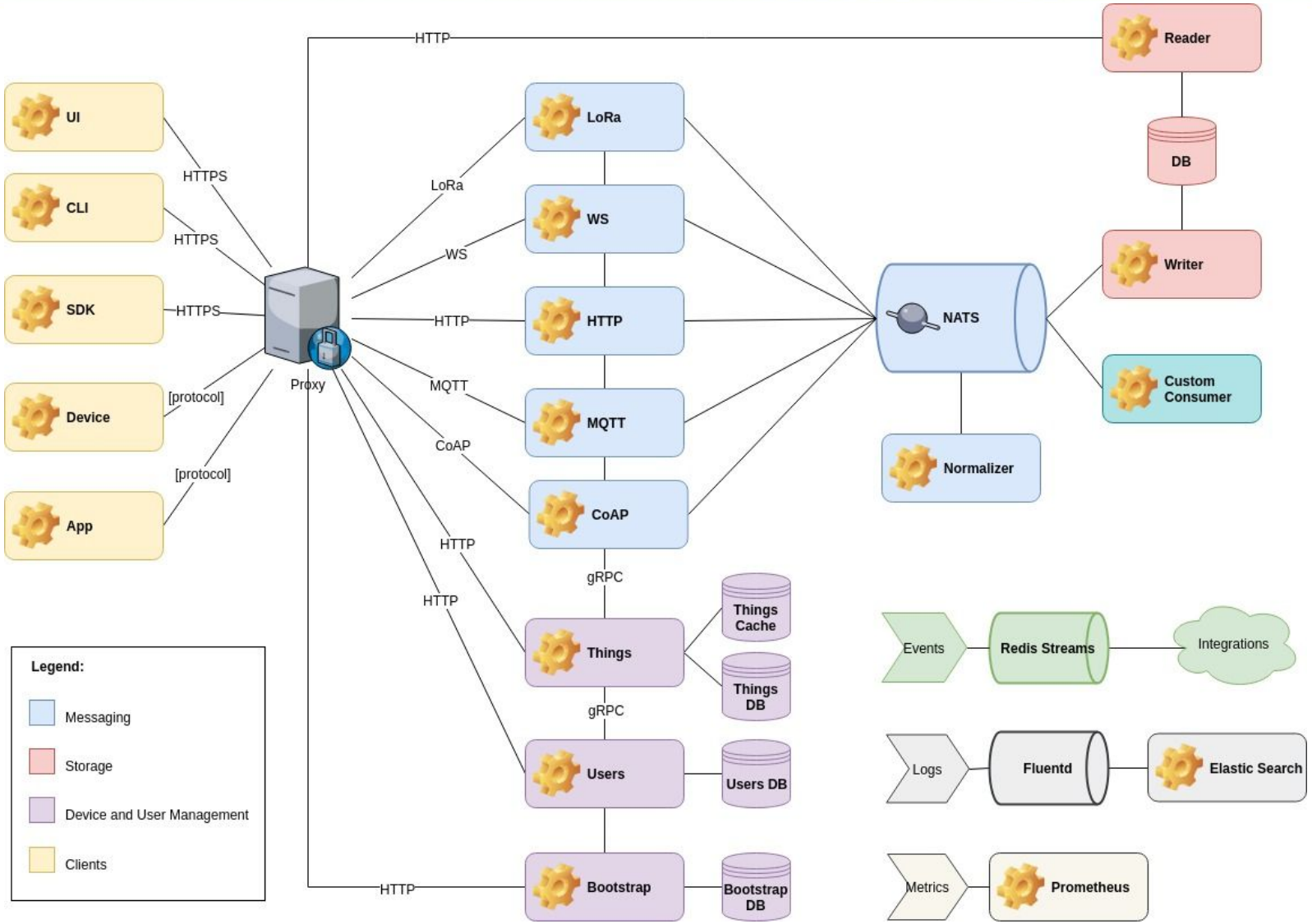
- Mainflux Scales from PRi class devices to multi datacenter with Kubernetes and Cassandra DB
- Deployment:
  - Native
  - Docker containers (compose provided)
  - Kubernetes scripts



Mainflux - Architecture

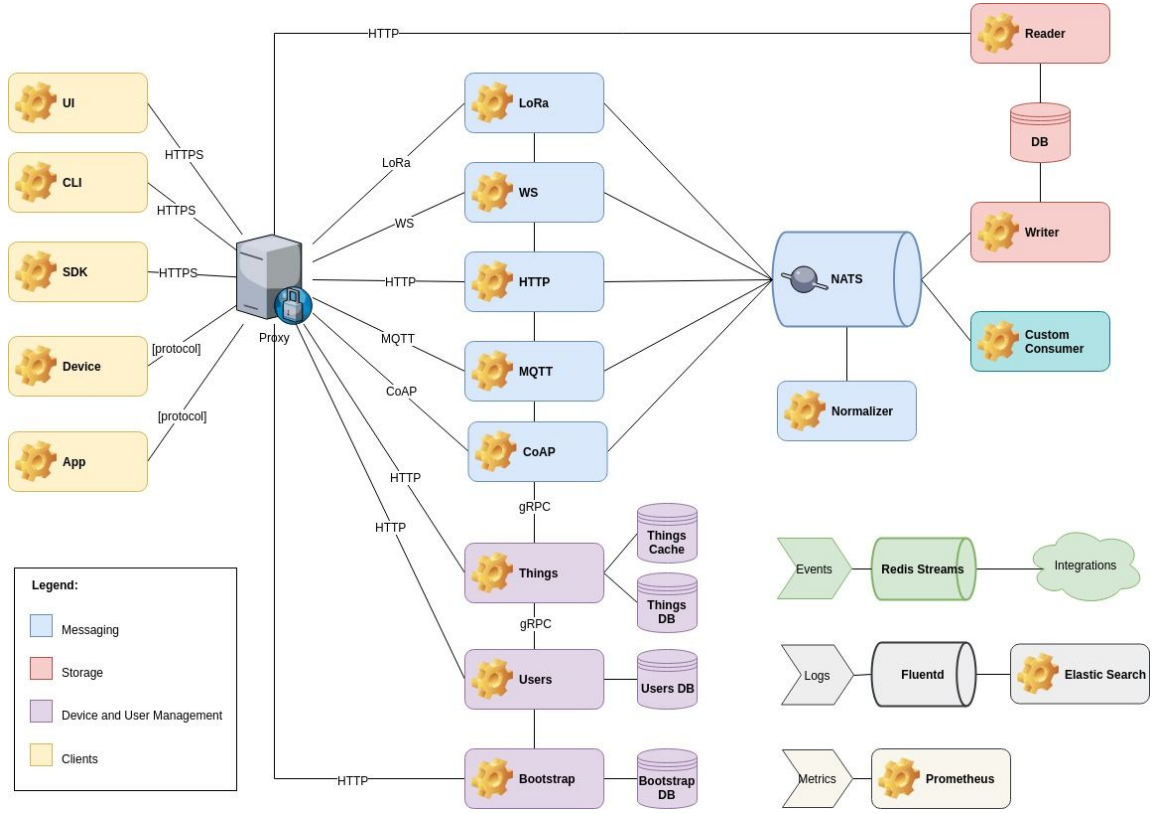


Mainflux - Architecture



Mainflux - Architecture

- **Users**
  - User represents a human user of the system and is basic entity in the Mainflux IoT Platform. User is authenticated by email and password.
  - Once authenticated user receives JWT to use for further actions.
  - Each user is Admin within his domain
- **Things**
  - Connected devices and applications are the same entity. We call them Things.
  - Internal representation of every device is saved to database
- **Channels**
  - Channel connects Things (devices and/or applications)
  - Only Things connected to the same Channel can communicate with each other.



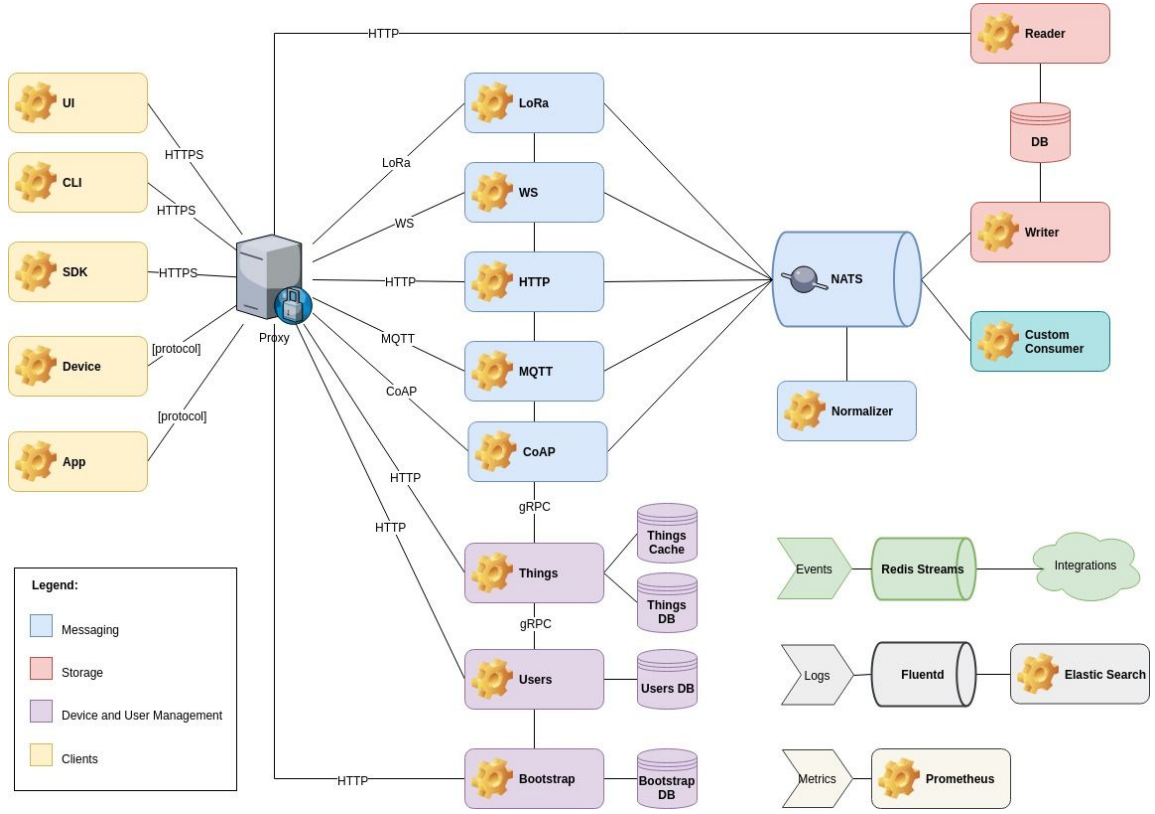
Mainflux - Security

Authentication with Mainflux keys

- Mainflux key is a secret key that's generated at the Thing creation

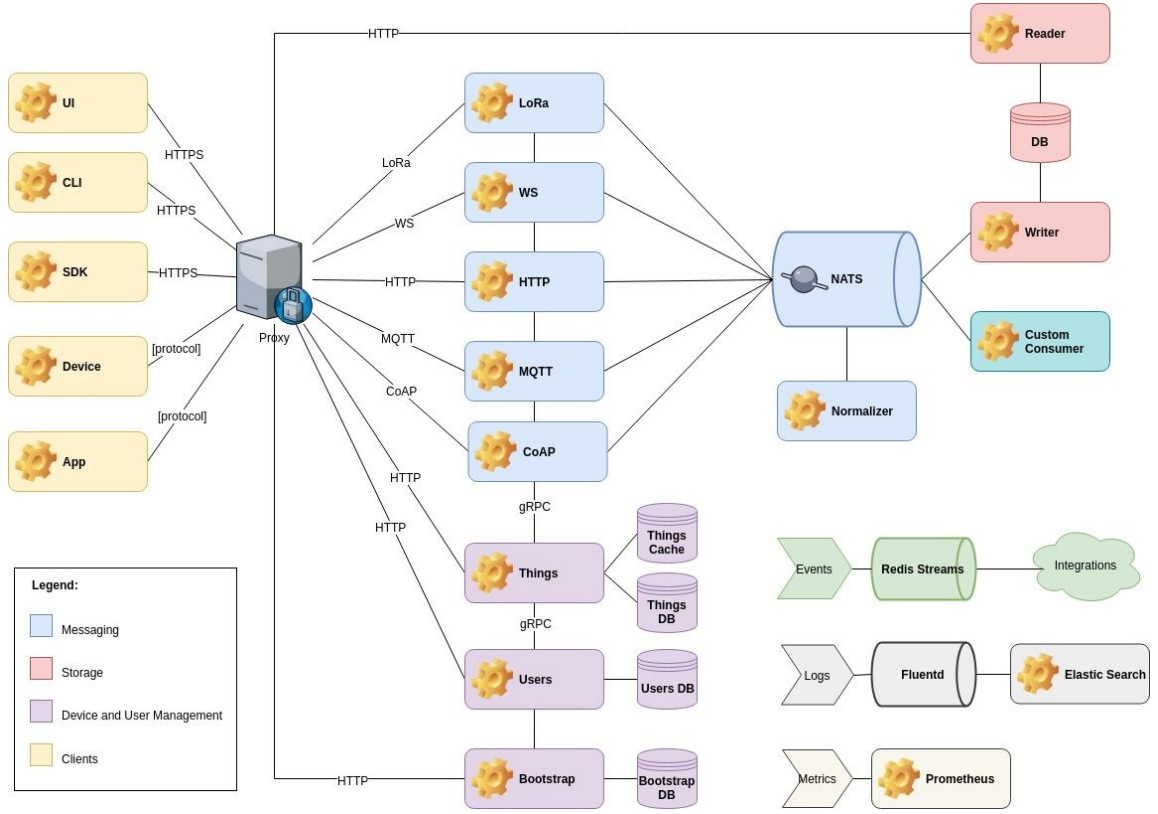
Mutual TLS Authentication with X.509 Certificates

- Client-to-server authentication using client-side X.509
- This is called two-way or mutual authentication
- Mainflux supports mTLS over HTTP, WS, and MQTT protocols (no CoAP at the moment)
- Thing key will be used to create x.509 certificate
- HTTPS – Authorization header does not have to be present
- MQTTS – Password filed in CONNECT message must match the key from the certificate
- WSS – Authorization header or authorization query parameter must match cert key



Mainflux - DevOps

- **Events**
  - Events are published to Redis Stream. This is useful for integration with 3rd party systems
- **Logs**
  - Fluentd
  - Elastic Search
  - Kibana
- **Metrics**
  - Prometheus
  - Grafana



Edge

EdgeX

An open source, vendor neutral project (and ecosystem)

A **microservice**, loosely coupled software framework for IoT edge computing

Hardware and OS agnostic

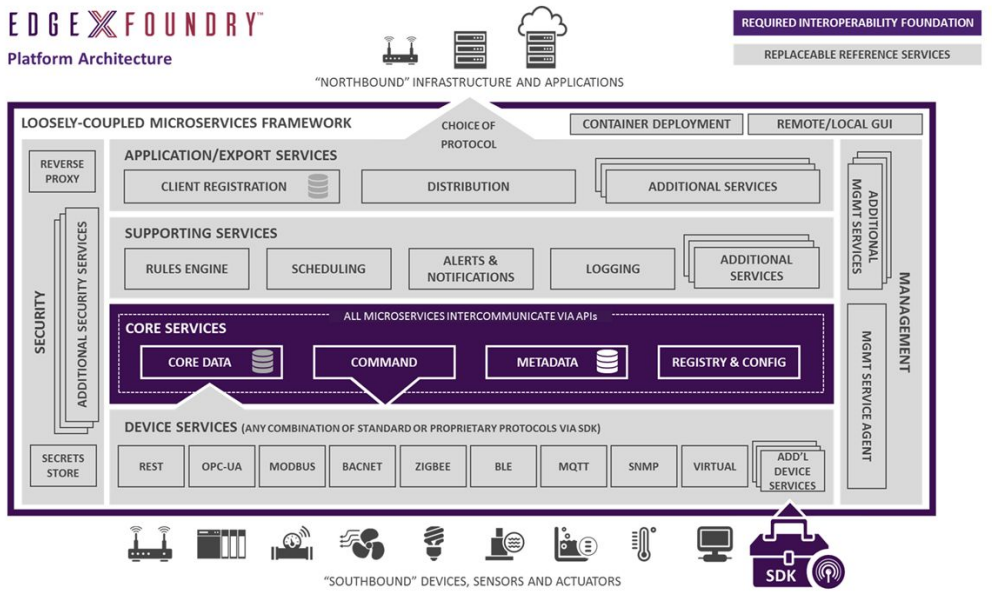
Linux Foundation, Apache 2 licensed project

Goal: enable and encourage growth in IoT solutions

- The community builds and maintains common building blocks and APIs
- Plenty of room for adding value and getting a return on investment
- Allowing best-of-breed solutions

EdgeX

- A collection of a 10+ microservices
- Written in multiple languages (Java, Go, C, … we are polyglot believers!!)
- EdgeX data flow:
  - Sensor data is collected by a **Device Service** from a thing
  - Data is passed to the **Core Services** for local persistence
  - Data is then passed to **Export Services** for transformation, formatting, filtering and can then be sent “north” to enterprise/cloud systems
  - Data is then available for edge analysis and can trigger device actuation through Command service
  - Many others services provide the supporting capability that drives this flow
- REST communications between the service
- Some services exchange data via message bus (core data to export services and rules engine)
- Micro services are deployed via Docker and Docker Compose



EdgeX - How it Works

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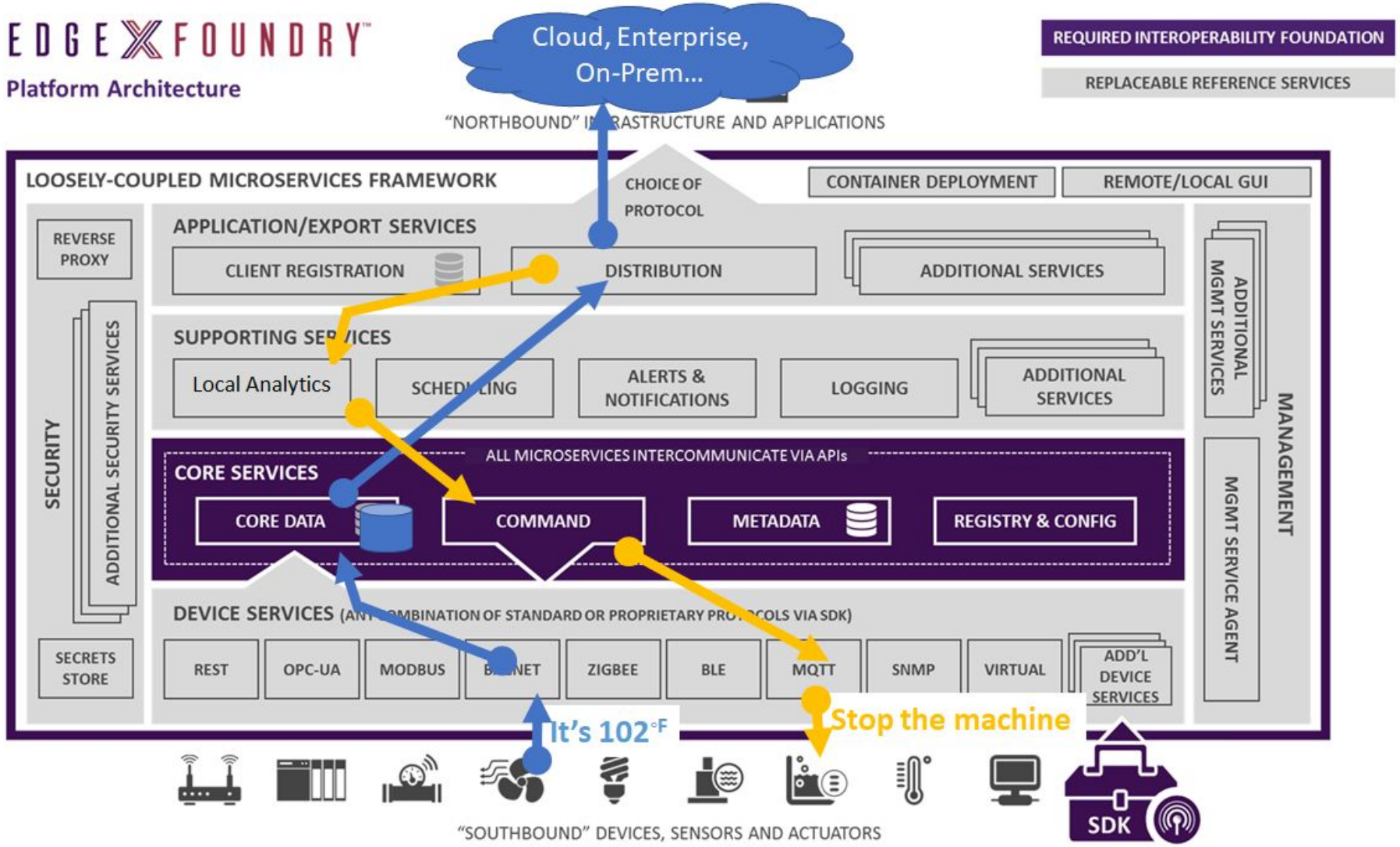
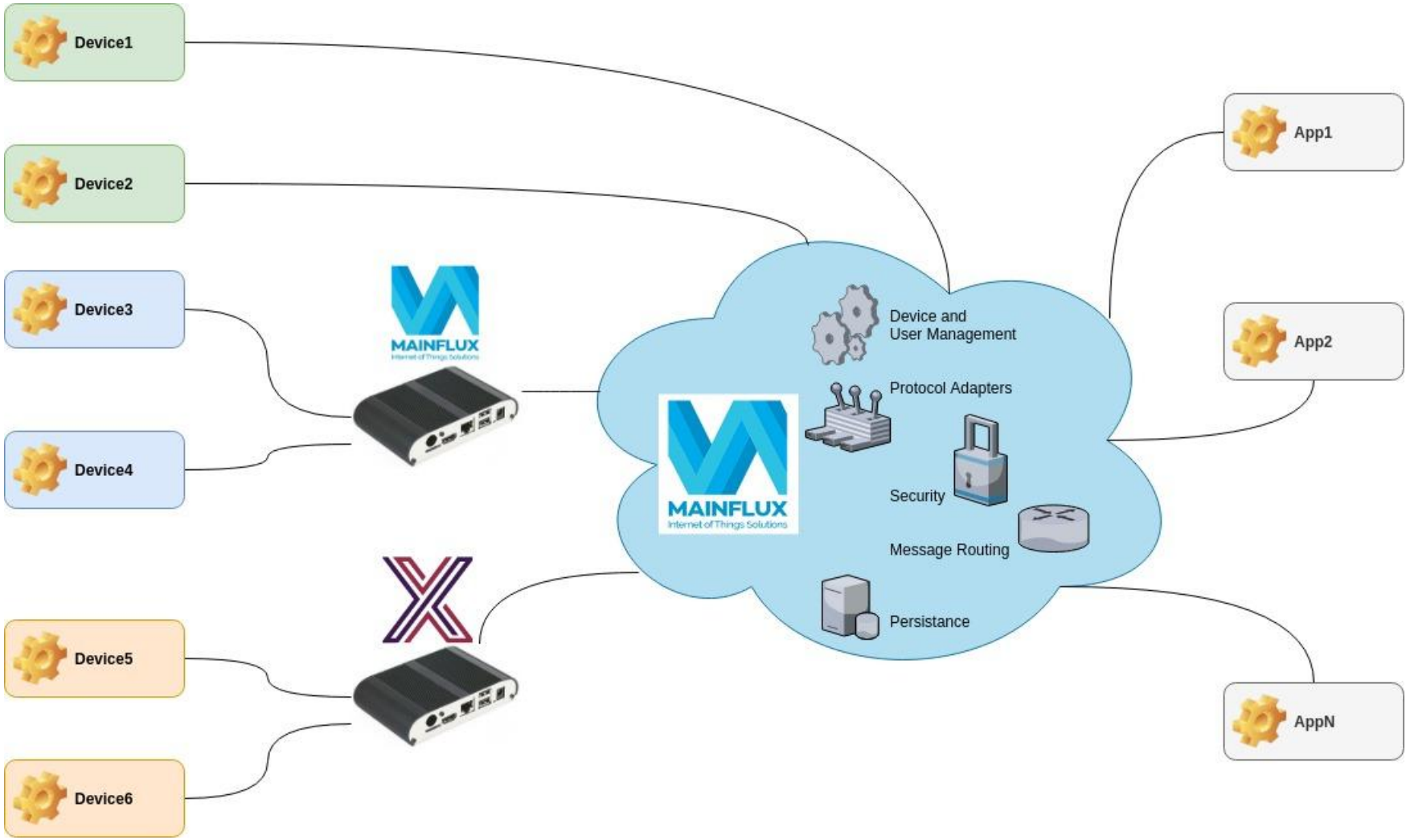


Integration

Edge-Cloud


Device1
Device2
Device3
Device4
Device5
Device6
MAINFLUX
Internet of Things Solutions
Device and
User Management
Protocol Adapters
Security
Message Routing
Persistance
App1
App2
AppN

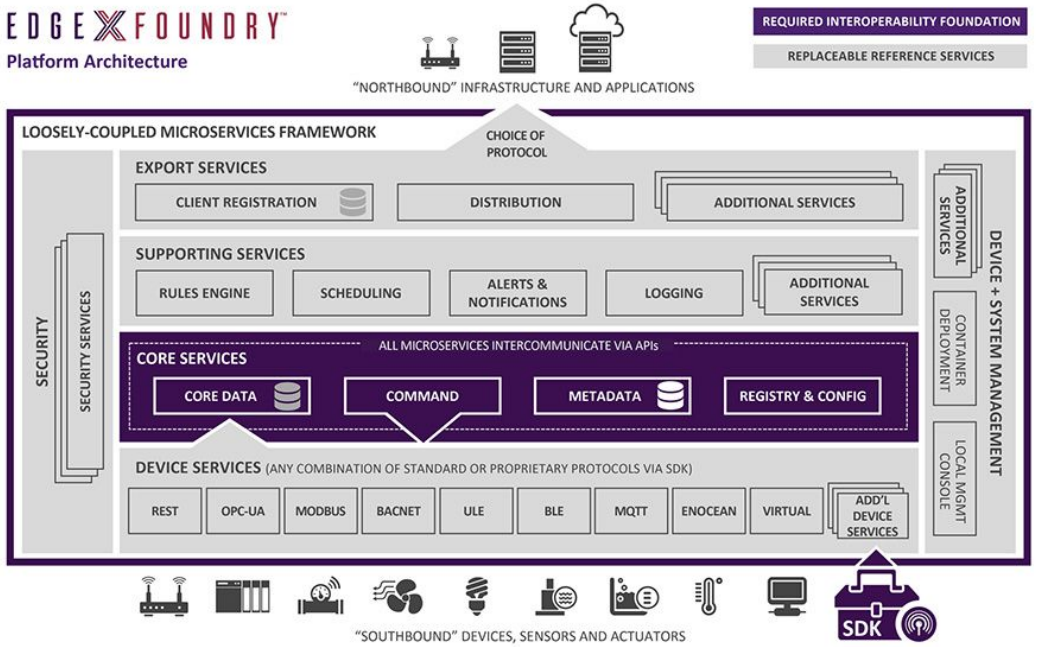
Mainflux on the Edge

- Unified IoT Platform - same code in the cloud and on the gateway
- Strong security - X.509 certificates and device tokens
- Small footprint - Docker images ~5MB
- Edged - IoT agent on the gateway
- Elm-based UI for administration

MAINFLUX
Internet of Things Solutions

EdgeX on the Edge

- Plethora of Device Services
- Linux Foundation LF Edge project
- MFX-1 distribution maintained by Mainflux Labs company
- Edged by Mainflux - IoT agent on the gateway
- SMA - remotely managed
- UI by VMware
- **Edgeflux** - full-blown cloud UI for managing EdgeX gateways - COMING SOON!



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Thank You!