FOSDEM'20

IoT Projects in FLOSS Foundations Dashboard

https://iotfloss.bitergia.net/

A dashboard based on communities data v0.1

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https://thingso2.com

https://bitergia.com

Bring to you by ...

Álvaro del Castillo

<adelcastillo@thingso2.com>

Open Source advocate and **developer**!

Working now in an **IoT platform** at ThingsO2

In love with **reactive technologies** and **functional programming**

Impressed by the IoT grow and possibilities

PLC4X committer

Valerio Cosentino

<valcos@bitergia.com>

GrimoireLab maintainer, CHAOSS contributor

Working at Bitergia

Interested in source code analysis, ETL processes and reverse engineering

Newbie in the IoT ecosystem

Outline

Overview

IoT architectures

- Apache Software Foundation (**AF**)
- Eclipse Foundation (**EF**)
- Linux Foundation (**LF**)

Project selection and classification

Findings and Insights

Conclusion

Overview

Why

More **visibility** is needed of what's happening on the FLOSS IoT landscape. This dashboard provides a place to better understand the IoT ecosystem.

How

The dashboard is made with GrimoireLab, an open source toolset for software development analytics. It's part of CHAOSS, a project under the Linux Foundation: https://chaoss.github.io/grimoirelab/

Contribute

Have a look at https://github.com/aylabs/iotfloss, and join us!

Warnings

Our initial focus was IIoT

We use IoT for simplicity but both are converging

Project selection and classification are debatable

Both are the pillars of the dashboard

Basic metrics in this version

CHAOSS project could help in future releases

All data you will see have CC by licenses when possible

The data owners are the projects

Selecting and comparing IoT projects

Mature projects included in FLOSS Foundations

*Apache Software Foundation (**ASF**), Eclipse Foundation (**EF**) and Linux Foundation (**LF**)*

Why: they follow quality rules for project adoption

Comparison based on categories

The categories are derived from the analysis of different IoT platforms in terms of vision and strategy and implementation

Foundations are compared based on the categories results

Metrics: changes in code (commits) and community size

IoT platforms

IoT Platforms include all the **systems needed to manage industrial deployments** in sectors like Oil & gas, Automotive, Aerospace, Transportation & Traffic, Energy or Manufacturing

The predicted **market is huge** for IoT USD 751.3 billion by 2023 (>20% grow/year)

Nowadays there are a **great number** of IoT platforms fighting to become one of the final references in the market

Architectures are well defined and are close to be **standardized**: good to organize IoT technologies in a common map based on categories

IoT platforms: basic features

Device Management

Support for protocols

Integration

Data Management

Analytics

Management of Applications

Security Audits

Robustness

Flexibility with low-code interfaces

Cloud computing, On-premises and Fog/Edge computing support

https://www.iotworldtoday.com/2019/08/07/top-10-iiot-platforms/

IoT platforms: architecture (IIRA by IIC)

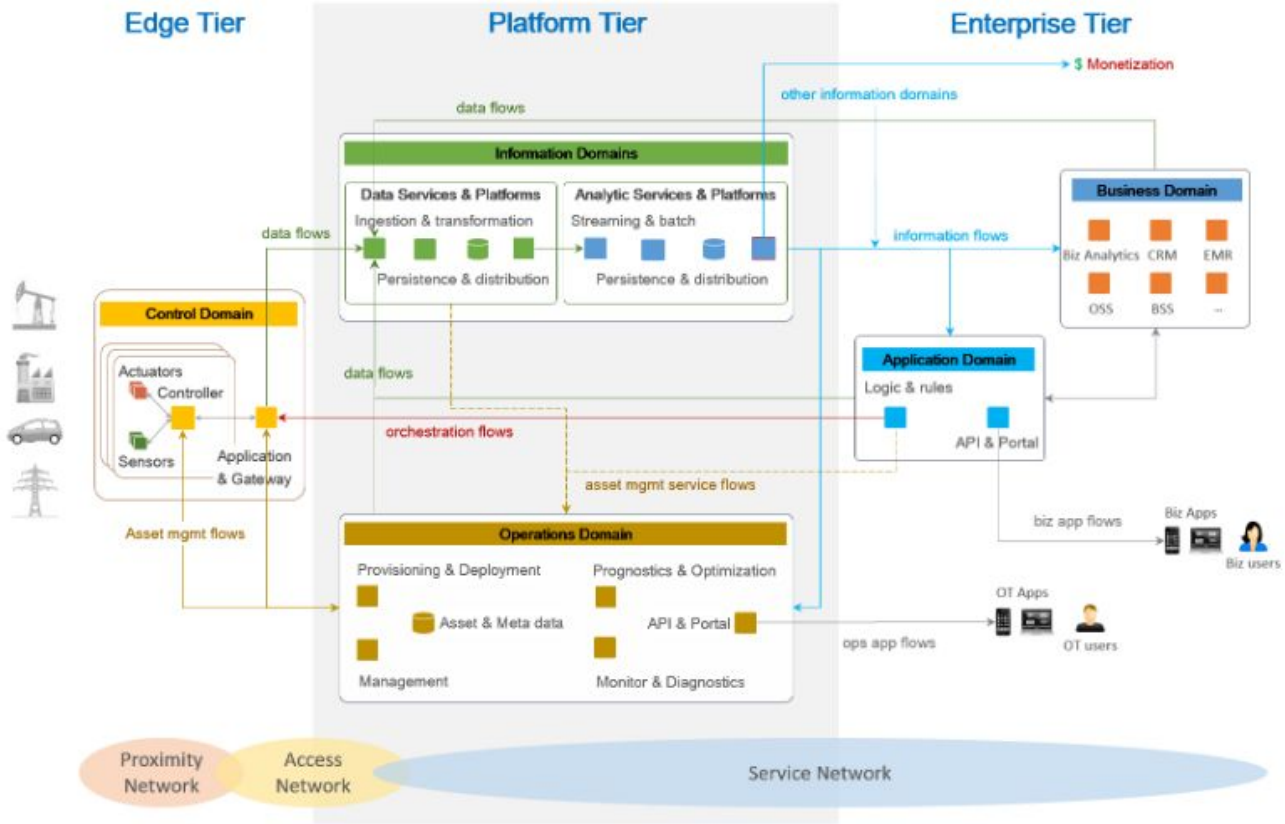
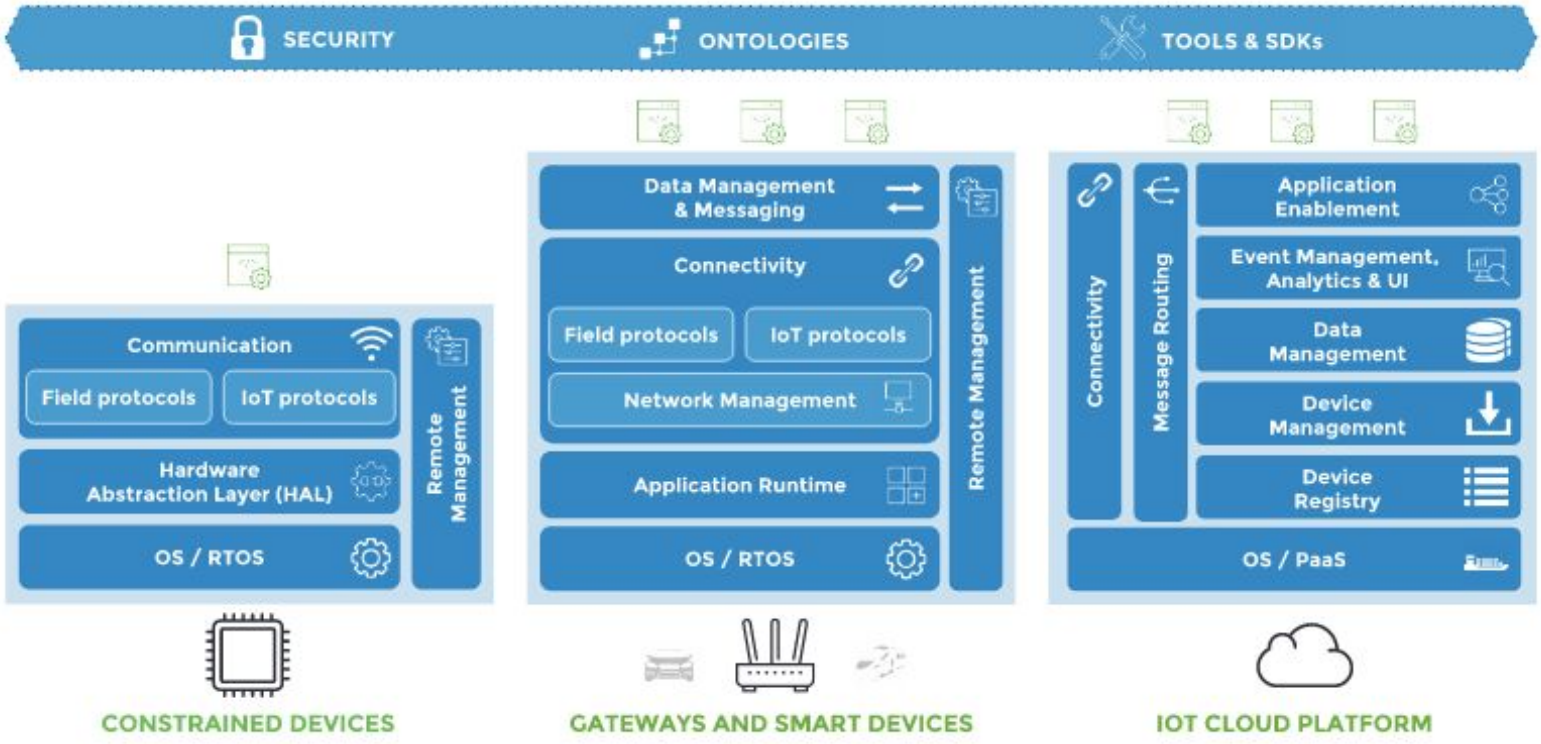
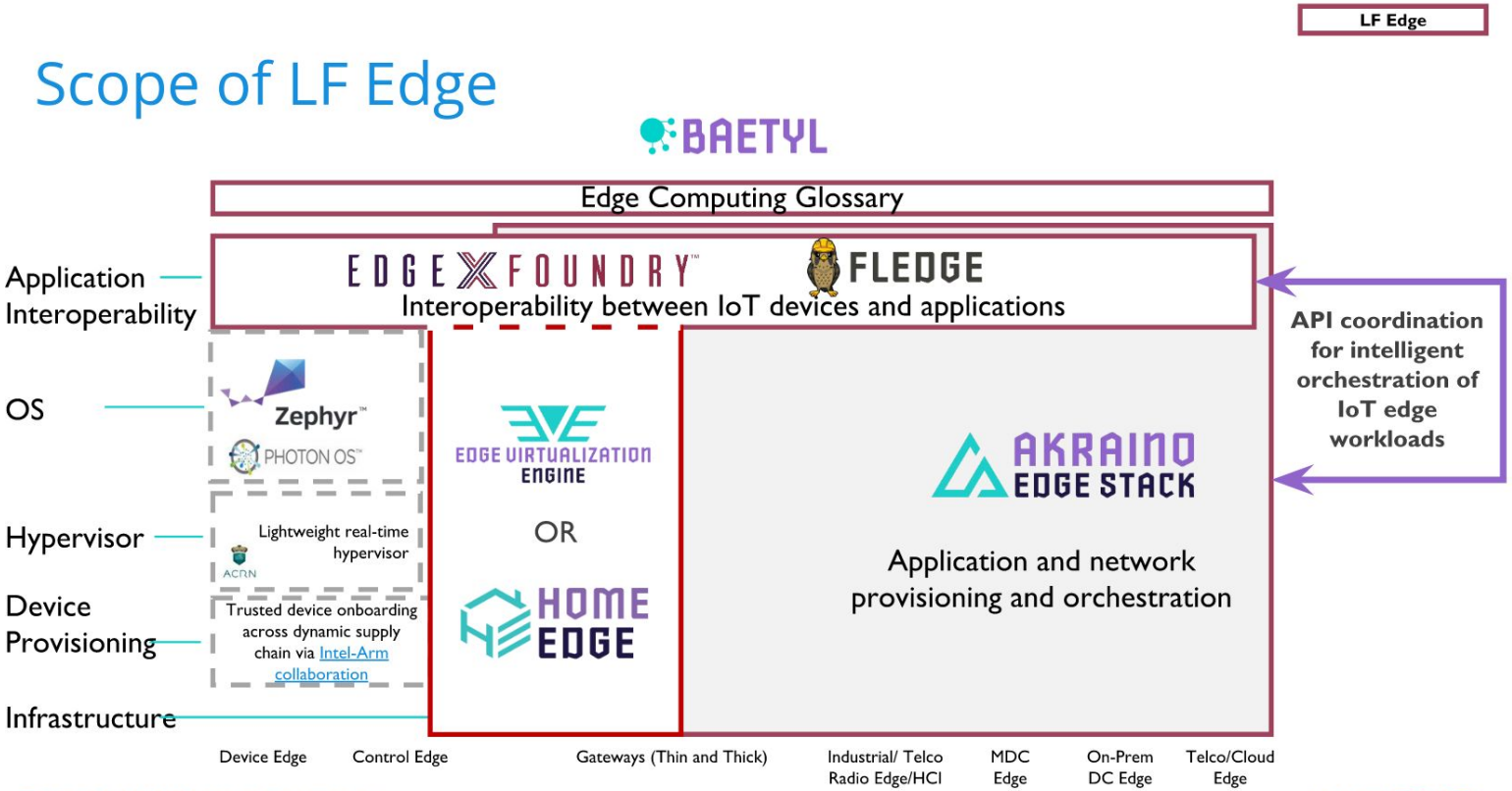


Figure 7-2: Mapping between a three-tier architecture to the functional domains

IoT platforms: Eclipse Foundation



IoT platforms: Linux Foundation



IoT platforms: ASF

Apache does not have an IoT strategy. It has emerged in some way from the projects that joined the Foundation

Apache IoT projects as seen by PLC4x project (2019)

Projects Classification

OS & virtualization

Protocol

Integration/Gateway

Processing

Persistence

Framework

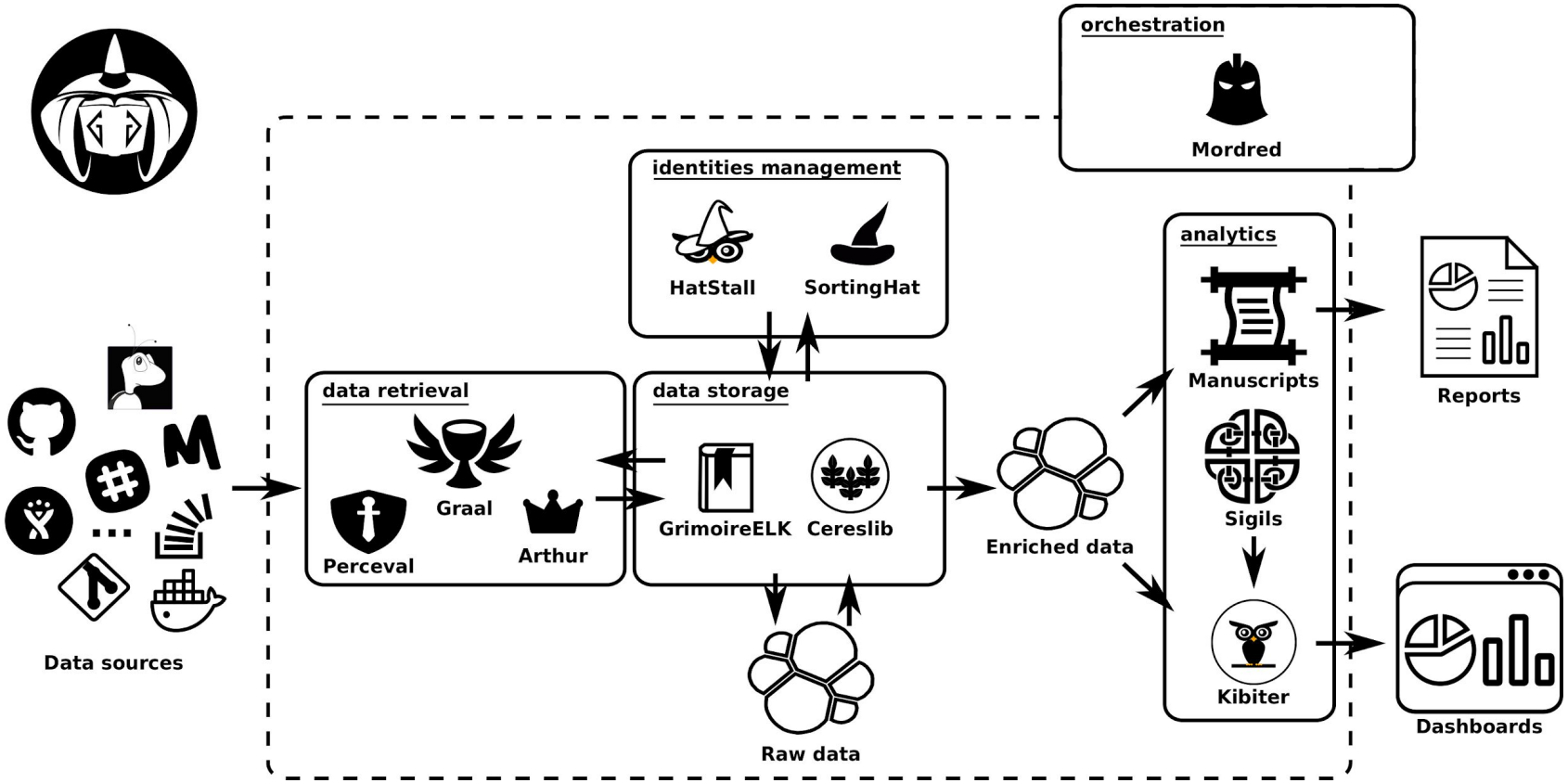
Platform

Application

Fog

Ecosystem

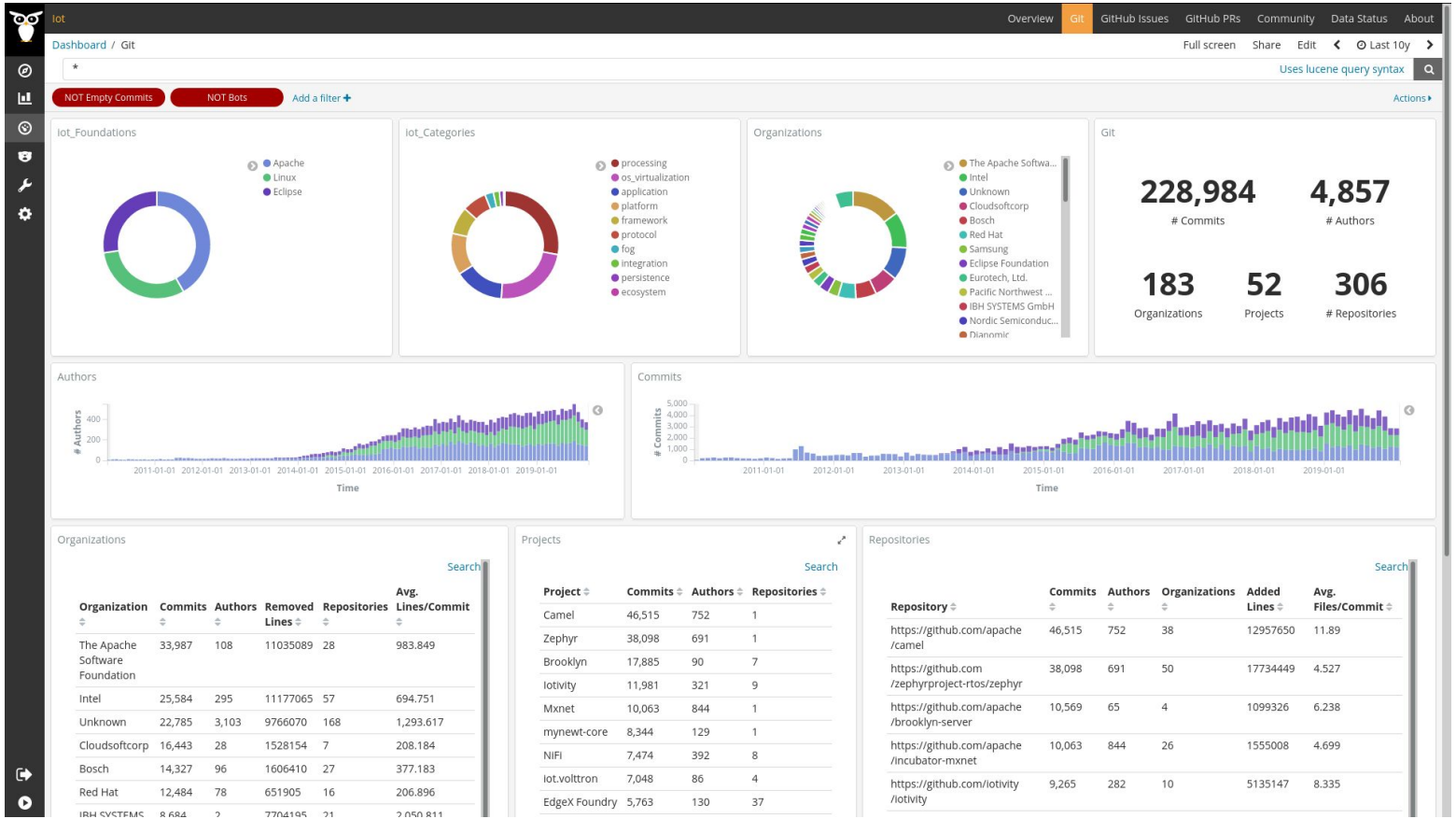
Findings and insights: GrimoireLab



Findings and insights: https://iotfloss.bitergia.net

The next slides showcase details for the last 10 years (until past Wednesday!)

Findings and insights: Global metrics



Findings and insights: Git activity

Large community: 5K authors and 200 organizations

Balanced number of commits between Foundations

ASF started first (2007) and then EF and LFN (2011)

EF accounts for 33 projects, followed by LF (11) and ASF (8)

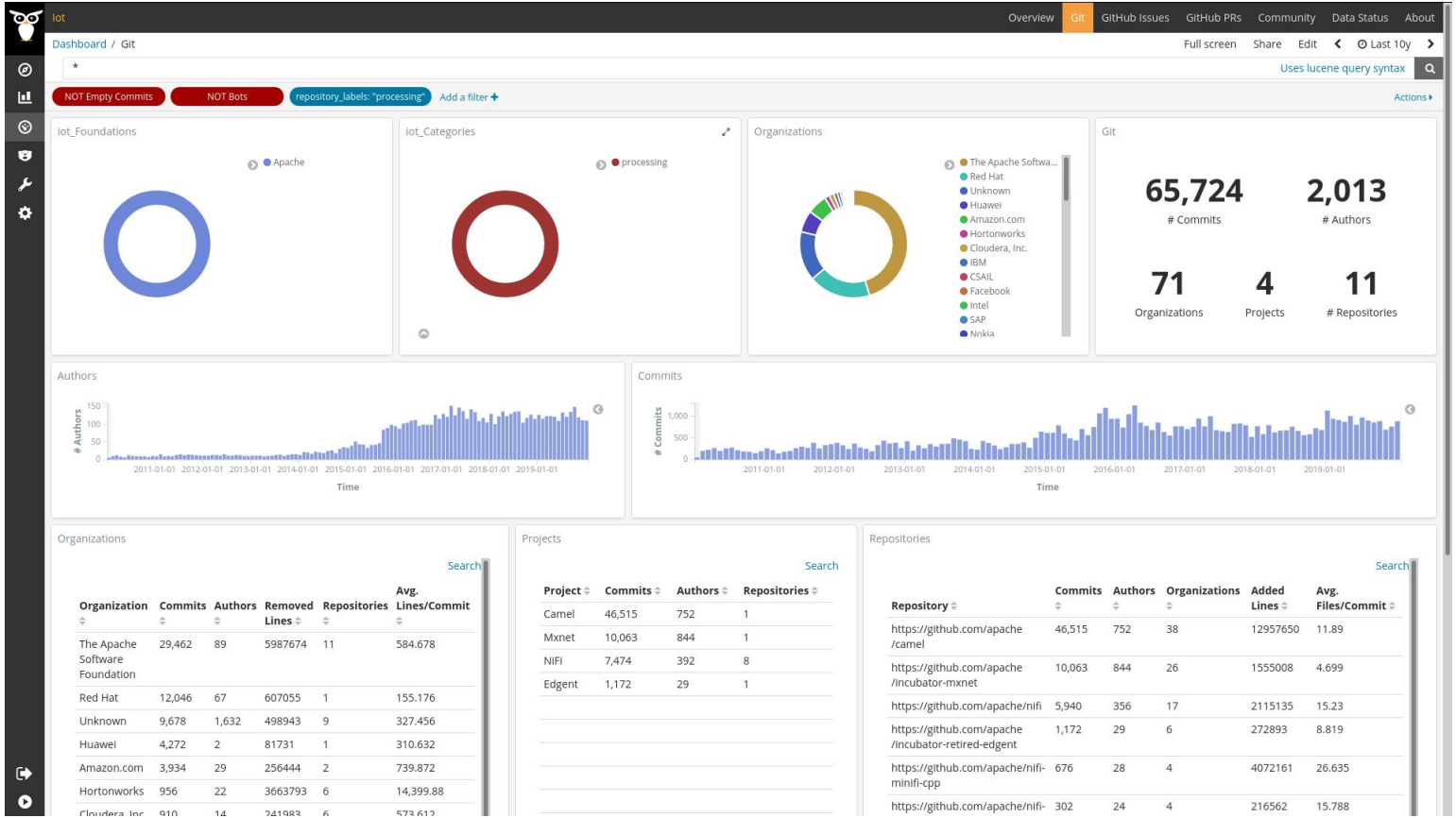
Top 5 organizations by projects:

ASF (16), Bosch (13), Intel (10), Red Hat (9) and Cloudsoft (7)

Top 5 projects:

Camel (ASF), Zephyr (LF), Brooklyn (ASF), IoTivity (LF) and MxNet (ASF)

Processing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Processing

Large community: 2K authors and 70 organizations (1/3 of the total numbers approx)

Community and activity numbers stable the last 3 years

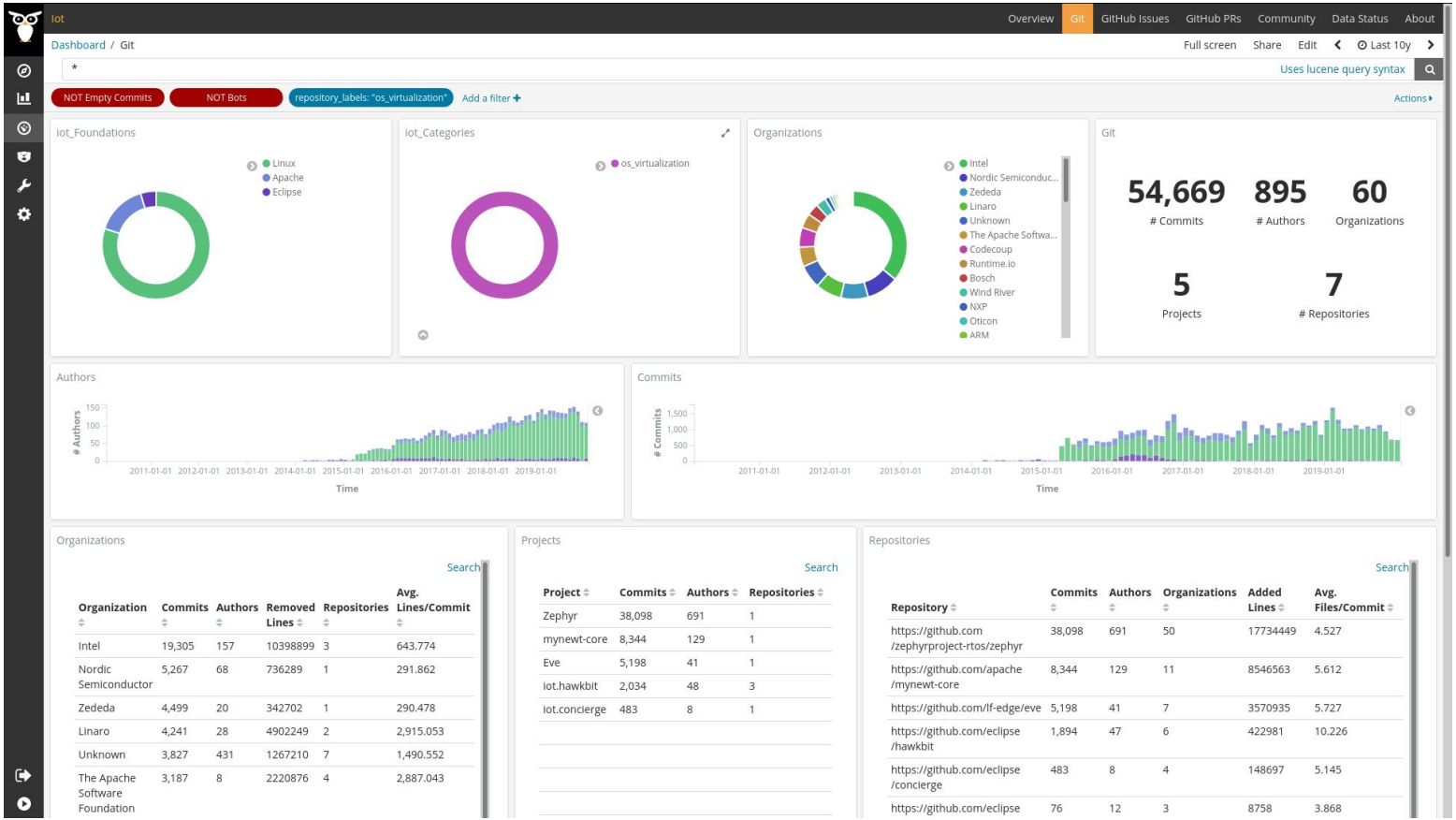
ASF is leading this category: all projects from ASF (strong Big data projects)

Cloud related projects are selected since used also in the Edge for IoT data processing

Large companies participation:

Redhat, Huawei, Amazon, Hortonworks + Cloudera, IBM, CSAIL (MIT AI), Facebook, Intel, SAP and Nokia

OS & Virtualization



OS & Virtualization

Large community: 1K authors and 60 organizations (20% total)

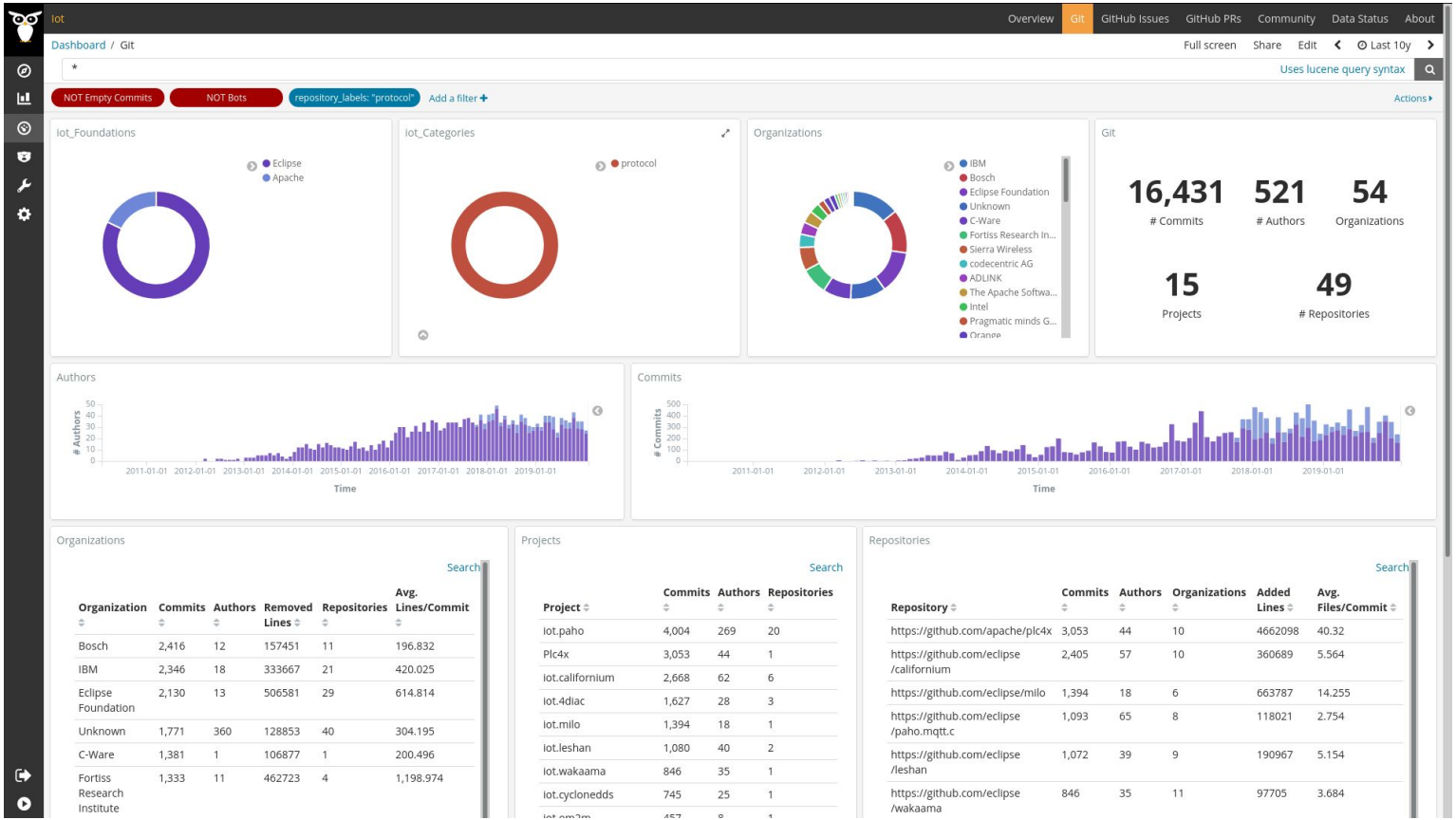
RTOS and virtualizations for embedded devices, integration (OSGi) and deploy platforms

Zephyr is “close” to Linux and it is huge. eVe is Linux EdgeX core. Apache has MyNewt and it is incubating Nuttx, another RTOS. Eclipse is focused in integration and deployment technologies, without a RTOS.

Intel, Nordic and Linaro are leading Zephyr orgs, and Zededa is behind LF eVe. Codecoup is working in both Zephyr and MyNewt!

Linux is leading this category

Protocol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Protocol

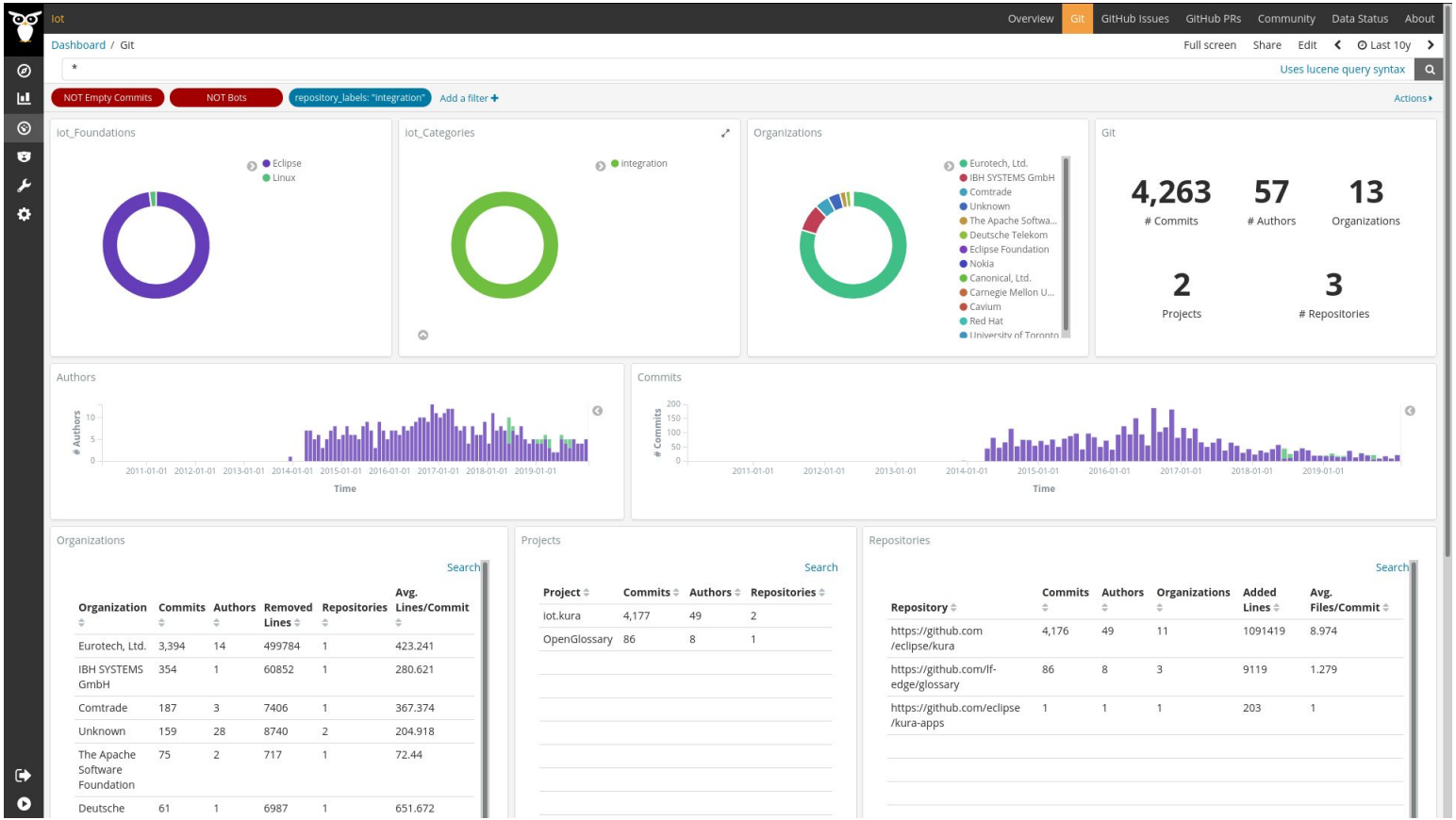
Medium community: 500 authors and 54 organizations (10% total) and 15 projects.

Eclipse is working in several protocols related implementations like MQTT, COAP, OPC-UA … Apache has PLC4x, the largest project offering a common API for all industrial protocols. Linux protocols support is inside the projects like EdgeX.

IBM (mqtt), Bosch, C-Ware, Fortiss and Sierra Wireless are the top companies in this category

Eclipse is leading this category

Integration/Gateway



Integration/Gateway

Small community based on from Eurotech organization

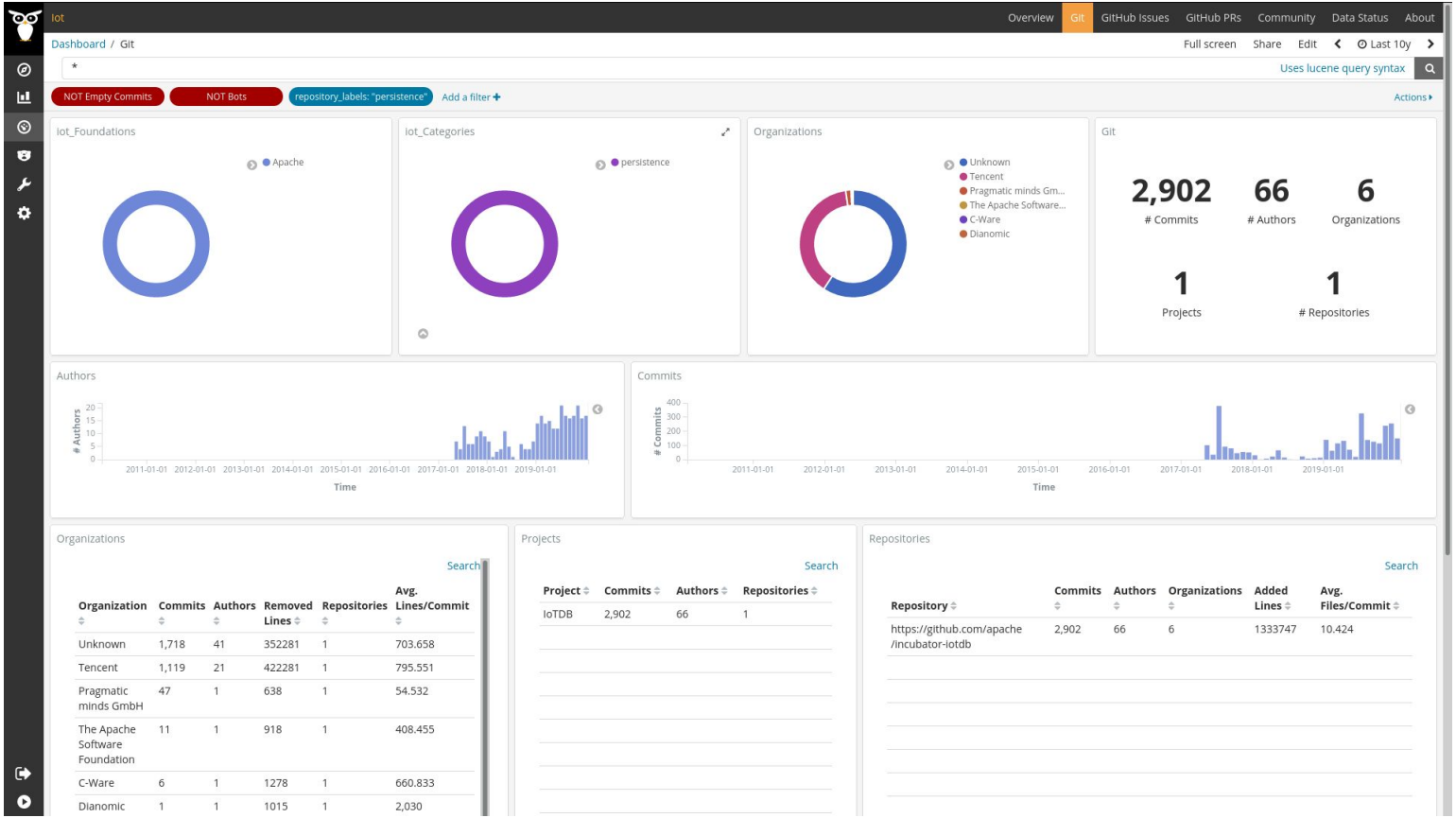
An integration platforms to be deployed in IoT gateways. At the code of Eurotech IIoT platform

Collaborating with Eurotech there are IBH Systems, Comtrade and Deutsche Telecom

NodeRED has not being analyzed but it is the other FLOSS alternative

Eclipse is leading this category

Persistence



Persistence

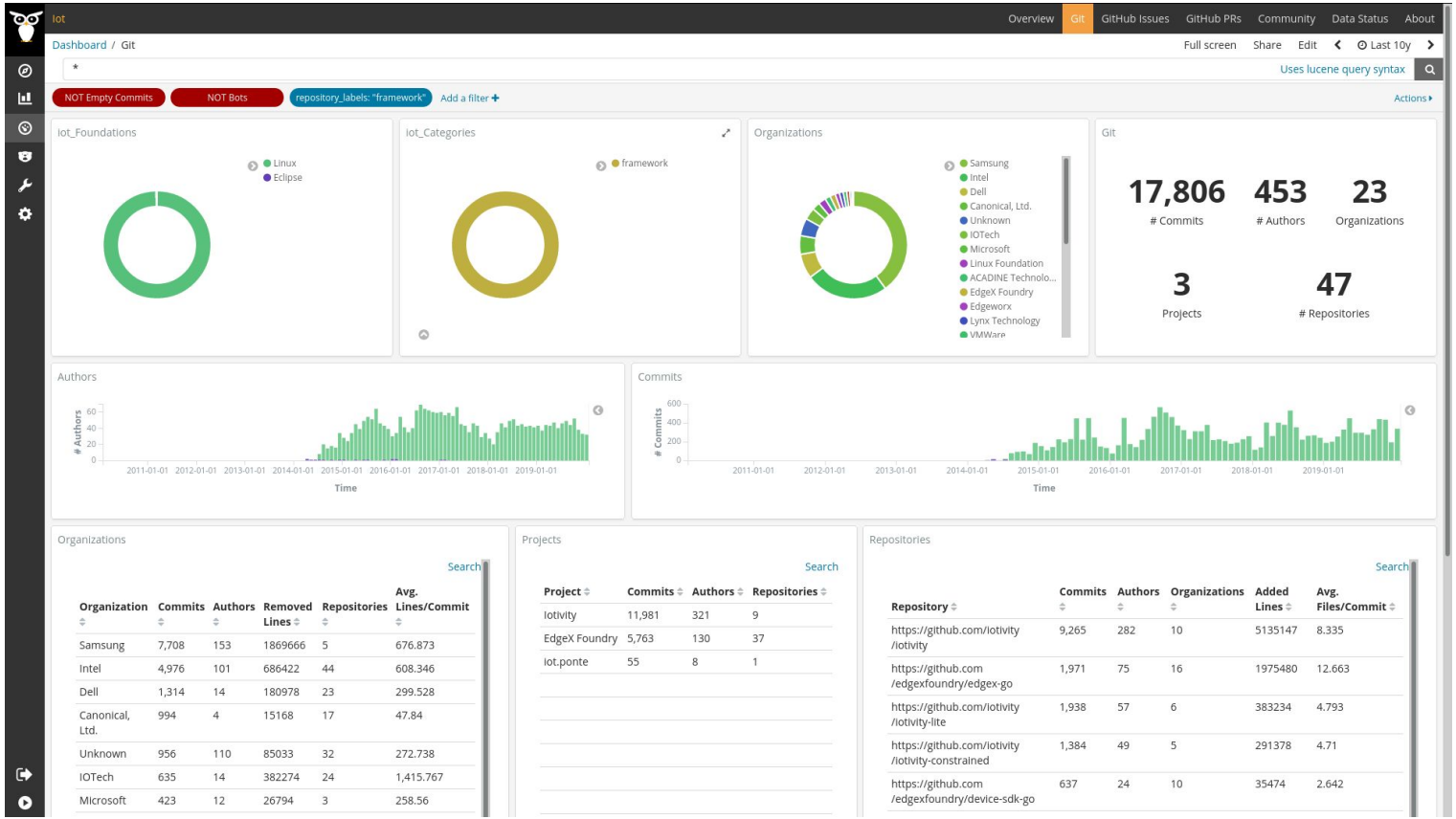
Small community from the creators of Apache IoTDB (Tencent and Pragmatic minds organizations)

There are others projects that could be included because its relation with IoT like Apache Calcite

This is persistence in the Edge

Apache is leading this category

Framework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ACADINE Technolo...
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Intel 4,976 101 686422 44 608.346
Dell 1,314 14 180978 23 299.528
Canonical, Ltd. 994 4 15168 17 47.84
Unknown 956 110 85033 32 272.738
IOTech 635 14 382274 24 1,415.767
Microsoft 423 12 26794 3 258.56
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EdgeX Foundry 5,763 130 37
Iot.ponte 55 8 1
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https://github.com/Iotivity/Iotivity-constrained 1,384 49 5 291378 4.71
https://github.com/edgexfoundry/device-sdk-go 637 24 10 35474 2.642

Framework

Medium community: 500 authors and 23 organizations (10% total)

Frameworks that are useful to build IoT platforms and services

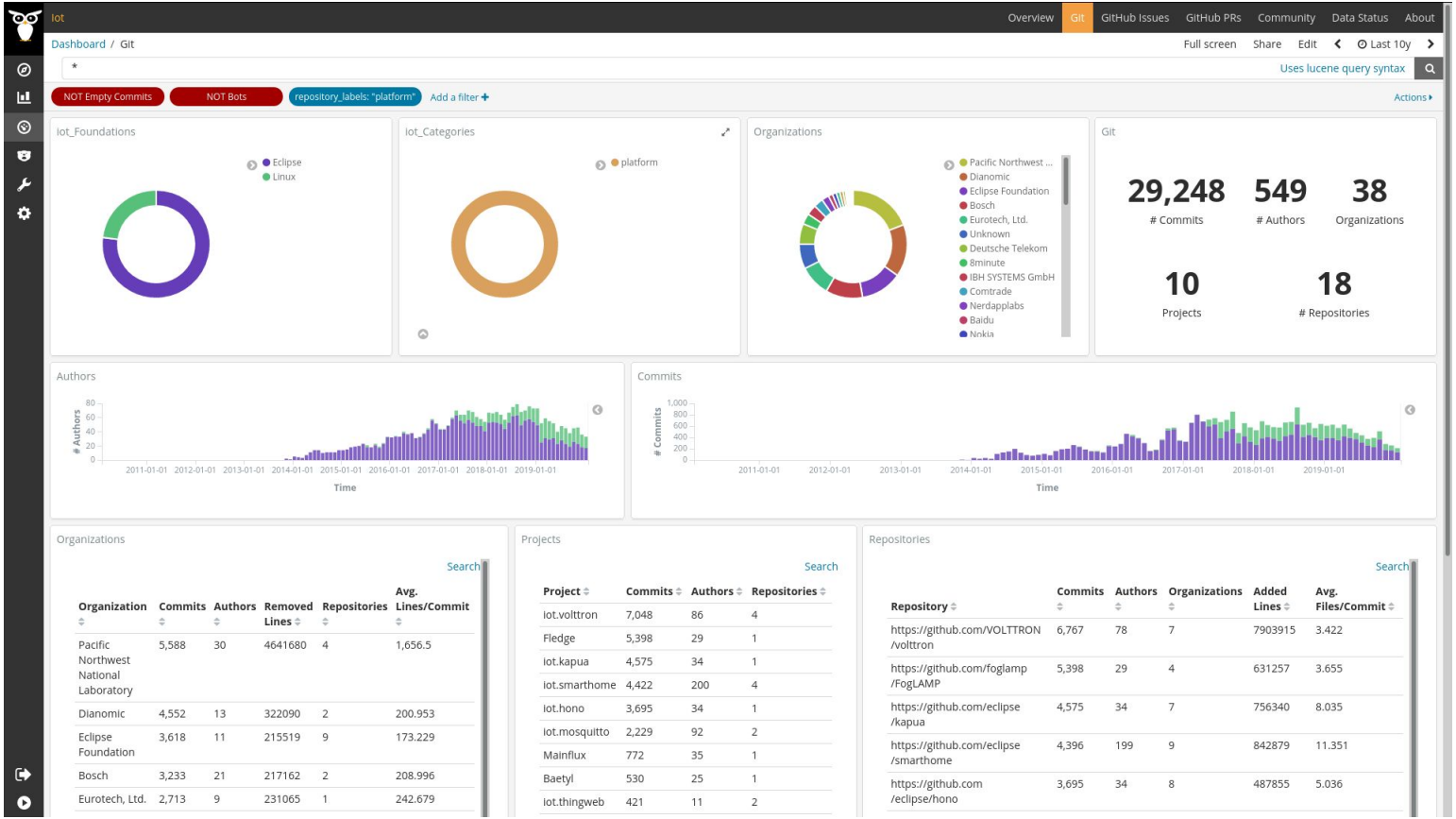
IoTivity is “close” to Linux but closer now to Open Connectivity Foundation to implement its standards and it is closer to smart-home.

Eclipse Ponte is a kind of gateway so it could be moved to Protocols

And EdgeX is the flagship of LF Edge strategy. Contributed by Dell, it has now strong players like Canonical, Intel and IOTech developing it. It has a strong grow in the number of authors and in the activity.

Linux is leading this category

Platform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Platform

Medium community: 500 authors and 38 organizations (10% total)

IoT complete platforms like Linux Fledge but also IoT systems like MQTT (Eclipse Mosquitto) and others. **Apache is missing**.

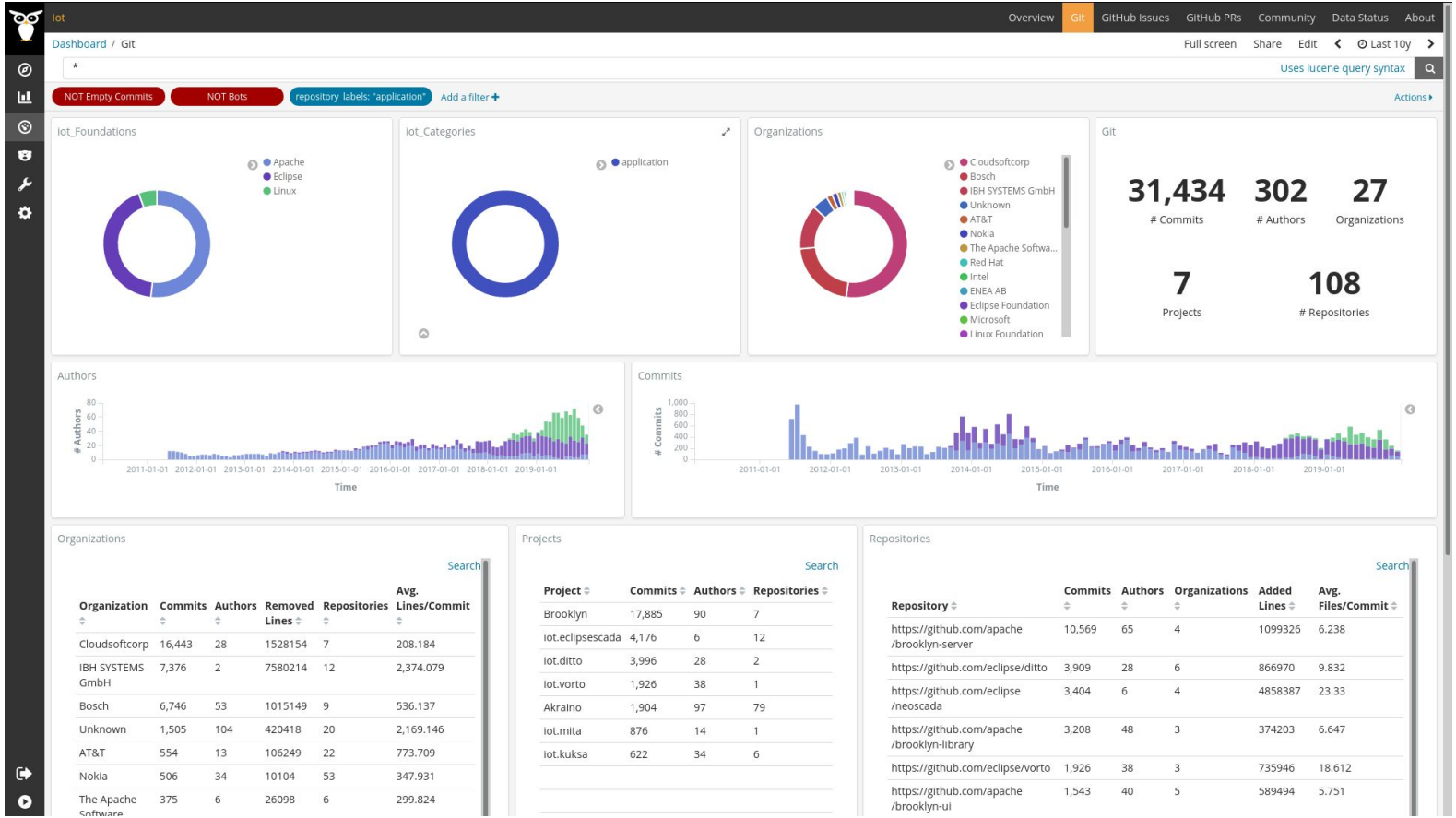
Close to out of the box technology which can be directly used

Eclipse Volttron, Kapua, Smarthome and Hono projects are leading this category, with Linux Fledge.

Pacific Nordwest, Dianomic, Bosch, Eurotech and Deutsche Telecom are leading the category

Eclipse is leading this category

Application



Application

Medium community: 300 authors and 30 organizations (5% total)

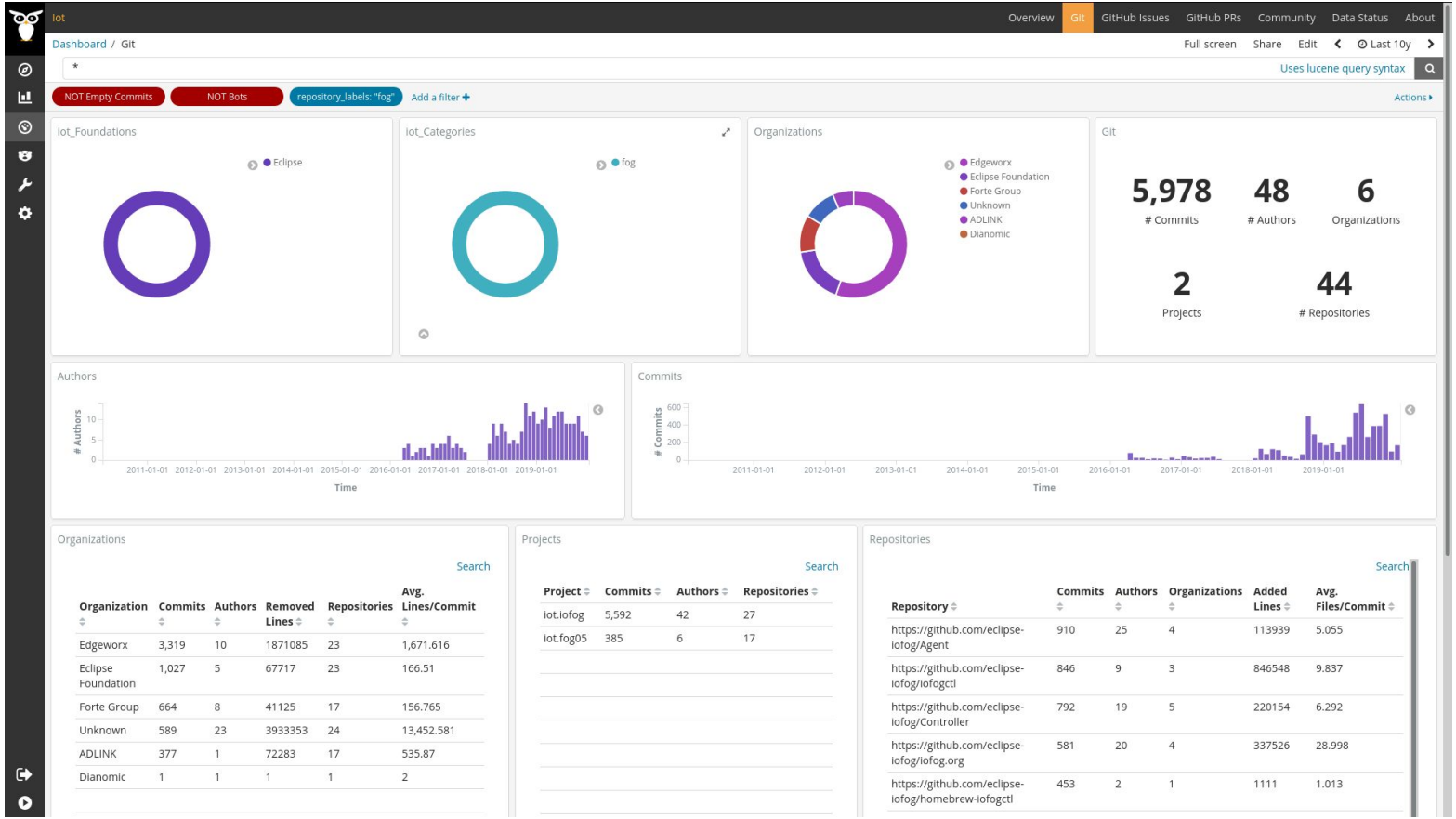
IoT platforms to deploy application on them and final applications like digital twin

Cloudsoftcorp, Bosch and IBH Systems are leading the category with their projects Apache Brooklyn, Eclipse Ditto/Vorto/Mita/Kusa and Eclipse Scada

In this category Bosch shows its strength in Open Source IoT

Eclipse is leading this category

Fog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Forte Group 664 8 41125 17 156.765
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https://github.com/eclipse-iofog/iofog.org 581 20 4 337526 28.998
https://github.com/eclipse-iofog/homebrew-iofogctl 453 2 1 1111 1.013

Fog

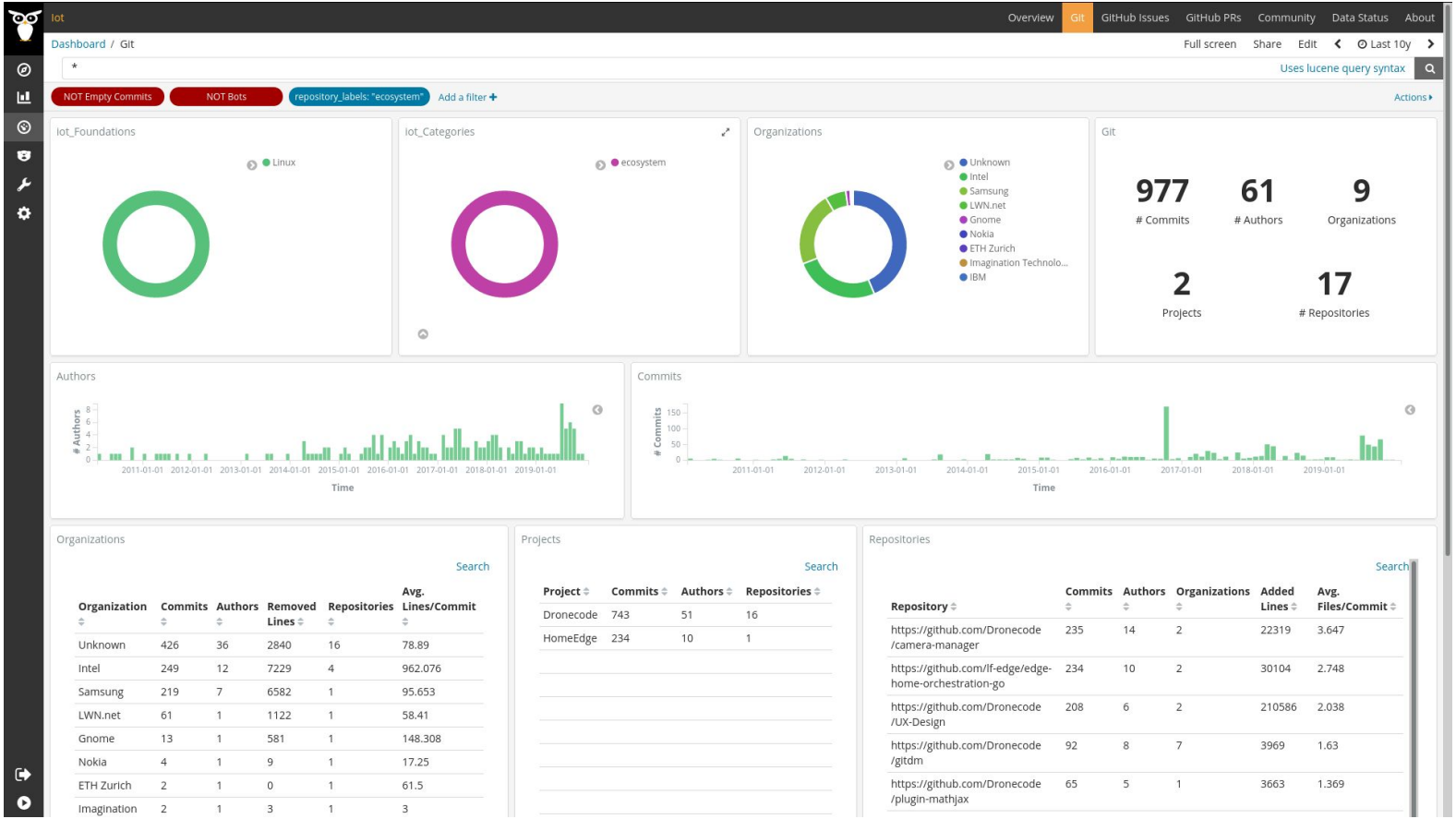
Small community: Eclipse projects for the fog in which are based the Eclipse Edge Native Working Group

A category to be reviewed to be merged in platforms or frameworks probably

ioFog is the main project lead by EdgeWorkx

And of course, **Eclipse is leading this category** ;)

Ecosystem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https://github.com/Dronecode/UX-Design 208 6 2 210586 2.038
https://github.com/Dronecode/gitdm 92 8 7 3969 1.63
https://github.com/Dronecode/plugin-mathjax 65 5 1 3663 1.369

Ecosystem

In this category there are two projects hard to classify in others: Dronecode and HomeEdge.

HomeEdge is a home edge computing framework.

Dronecode mission is “Building a sustainable open source ecosystem for critical Drone components”

Intel and Samsung are the main contributors in this category.

Linux is leading this category

Findings and insights: Summary

Category	Foundation	Com Size	Project	Companies
Processing	ASF	L	Camel	Red Hat, Huawei, Amazon
OS & virtualization	LF	L	Zephyr	Intel, Nordic, Zededa
Protocol	EF	M	Paho	IBM, Bosch, C-Ware
Integration/gateway	EF	S	Kura	Eurotech, IBH Systems, Comtrade
Persistence	ASF	S	IoTDB	Tencent, Pragmatic minds
Framework	LF	M	IoTivity	Samsung, Intel, Dell
Platform	EF	M	Volttron	Pacific Northwest, Dianomic, Bosch
Application	EF	M	Brooklyn	Cloudsoft, Bosch, IBH Systems
Fog	EF	S	IoFog	EdgeWorX, Forte Group, ADLink
Ecosystem	LF	S	Dronecode	Intel, Samsung, Nokia

Conclusion: And the winner is … FLOSS

Apache is strong in data: persistence, processing and communications. Its Big Data position is probably the reason. It does not have a strong IoT strategy but it is attracting IoT projects naturally.

Eclipse has the richer IoT projects ecosystems, it is present in most of the categories and leading them. And it has strong industrial support like Bosch or Eurotech.

Linux is favored by “close” projects like Zephyr and IoTivity, but its Edge strategy **is attracting big projects** like EdgeX, Fledge, eVe or Akraino and more are coming.

Checking the coverage of the data

In the PAC Radar of IoT platforms based on Open Source in Europe 2019 analyzing best companies in the market:

Bosch and Eurotech (leaders) are working in EF

Mainflux (second position with other 3) is working in LF

So **foundations are attracting the big Open Source** players at least in Europe

Mozilla Foundation IoT with its Web Things platform is on the radar

Collaborations between projects

Apache PLC4x using Eclipse Milo, Eclipse Ditto and others

People from Apache working in other Foundations

Eclipse Kura uses Apache Camel

How to find these collaborations?

How to promote them?

- This dashboard helps offering visibility
- The FOSDEM IoT devroom attracts communities together!

Takeaways

The IoT landscape is full of FLOSS projects, where foundations such as ASF, LF, EC and big companies (Bosch, Intel, Eurotech, ...) are actively involved

Where is the dashboard? https://iotfloss.bitergia.net/

Can I contribute? **YES** https://github.com/aylabs/iotfloss

Help us by suggesting new **classifications, projects and insights**!

@acstw @_valcos_

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