



VIDEO



ABSTRACT

LF Edge Summit is a 90 minute, single-track event on the topic of IoT and Edge Computing. The main goal of this LF Edge event is to provide an overview of the edge projects under the umbrella including Akraino Edge Stack, EdgeX Foundry, Project EVE and more. LF Edge leaders will share insight into what's to come, and discuss Edge business models & use cases. There will also be an Edge Panel: Business model innovations brought by 5G and Edge computing 5G, Edge computing, cloud native, and AI will transform the telco and many vertical industries. These technologies will create many business models that we have not seen before. The current health crisis has created new thinking and how we leverage and apply these technologies to common good. In this panel, we will discuss these technologies, business models, use cases across many industries.

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EdgeX Foundry Overview

Jim White, CTO IoTech

#ossummit @twitterhandle





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About Me



- Jim White (jim@iotechsys.com)
 - IOTech CTO
 - Global B2B software products company
 - Initial market focus: Industrial IoT Edge – Global coverage
 - Formerly – Dell Technologies director and team lead
 - IoT Platform Development Team
 - Dell Technologies IoT Solutions Division – Distinguished Engineer
 - Chief architect and lead developer of Project Fuse
 - Dell's original IoT platform project that became EdgeX Foundry
 - Yes – I wrote the first line(s) of code for EdgeX (apologies in advance)
 - EdgeX Foundry ...
 - Vice Chairman, Technical Steering Committee
 - Ad hoc and unofficial lead architect

IOTech

DELL
Technologies



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What is EdgeX Foundry?



- An open source, vendor neutral project (and ecosystem)
- A micro service, loosely coupled software framework for IoT edge computing
- Hardware and OS agnostic
- Linux Foundation, Apache 2 project
 - Started April 2017





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Huh??

It's open source
middleware for the
edge





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A Brief EdgeX History

- Chartered by Dell IoT marketing in July 2015
 - A Dell Client CTO incubation project (Project Fuse)
- Designed to meet interoperable and connectivity concerns at the IoT edge
- Started with over 125,000 lines of Dell code
- Entered into open source through the Linux Foundation on April 24, 2017
 - Started with nearly 50 founding member organizations; today we have more than 75
- Release Cadence: 2 formal releases a year
 - Barcelona – Oct 2017
 - California – Jun 2018
 - Delhi – Oct 2018
 - Edinburgh – July 2019
 - Fuji – Oct 2019
 - Geneva – May 2020
 - Hanoi – Oct 2020
 - Ireland – April 2021
 - Jakarta – Oct 2021
 - Kamakura – April 2022





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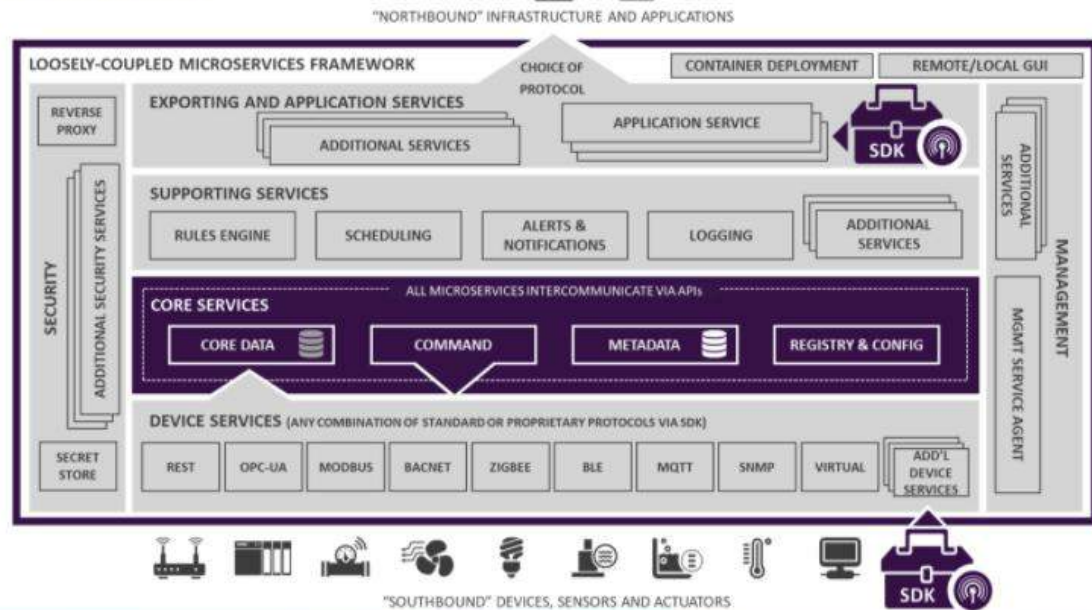
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EDGE X FOUNDRY™

Platform Architecture





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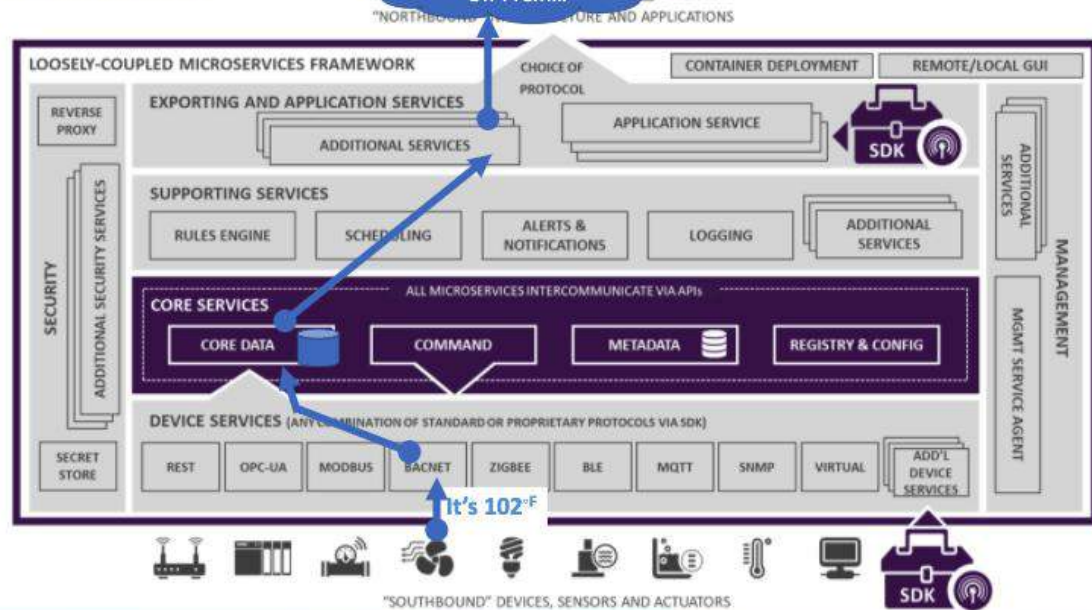
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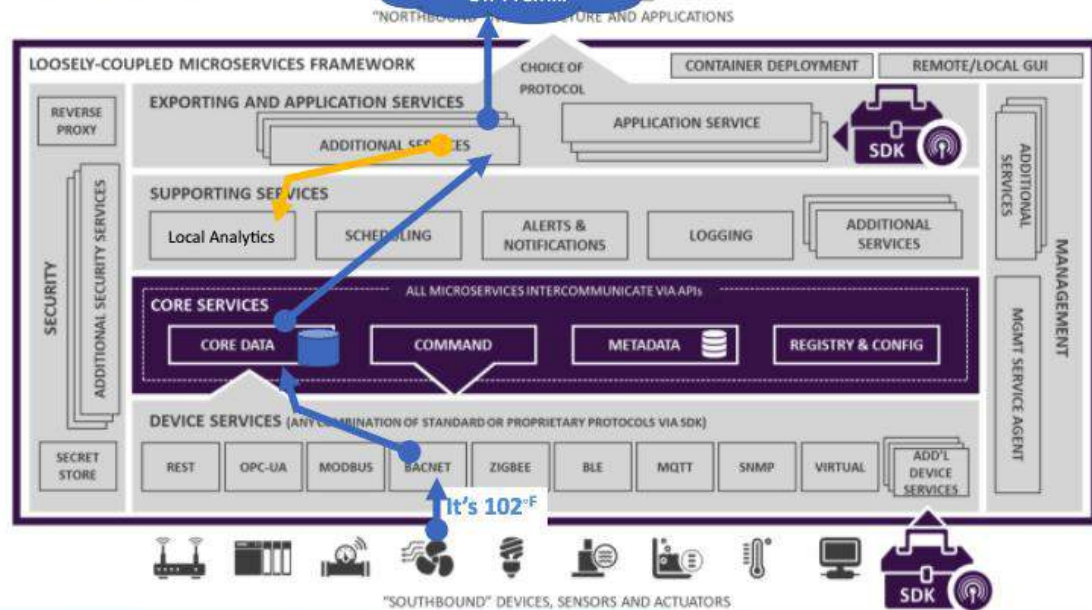
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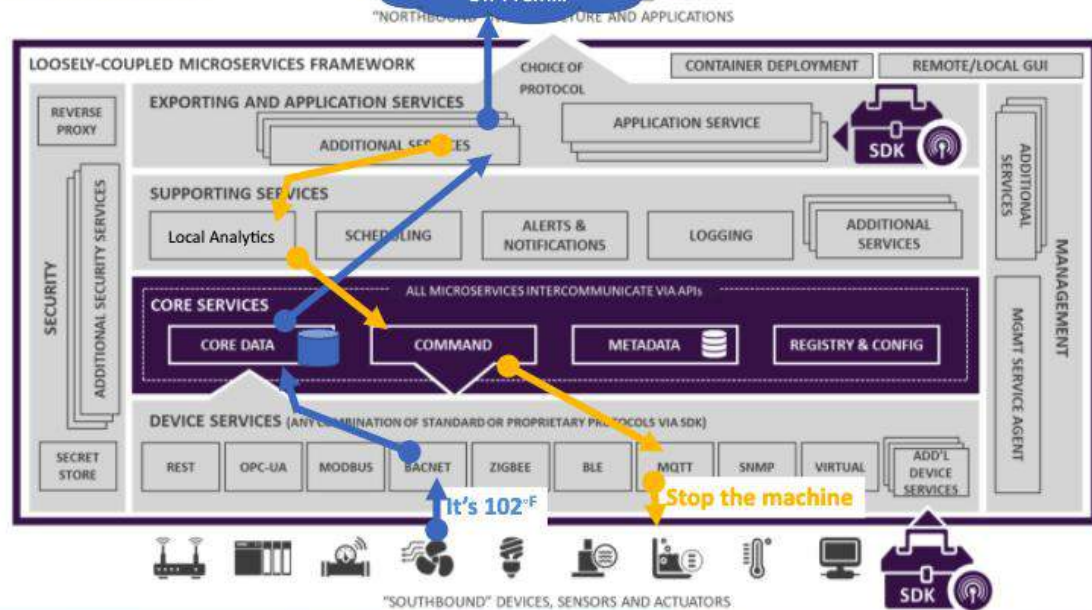
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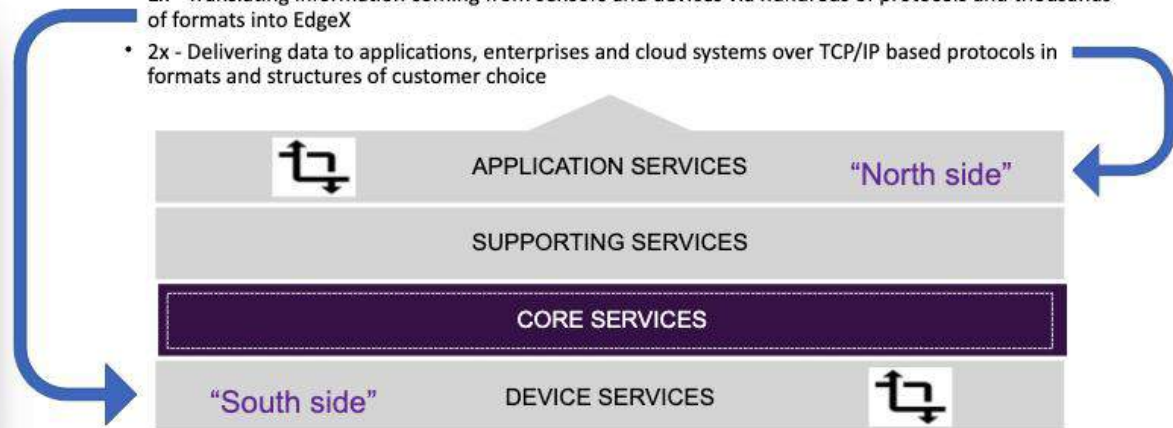
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Boiling it down

- Crudely speaking, the layers (and services) of EdgeX constitute a **dual transformation engine**
 - 1x - Translating information coming from sensors and devices via hundreds of protocols and thousands of formats into EdgeX
 - 2x - Delivering data to applications, enterprises and cloud systems over TCP/IP based protocols in formats and structures of customer choice





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What is EdgeX again?

- Open source edge middleware that provides dual transformation
 - From any thing protocol to EdgeX data format/structure
 - From EdgeX data format/structure to any (TCP/IP) enterprise need

EDGE X FOUNDRY™





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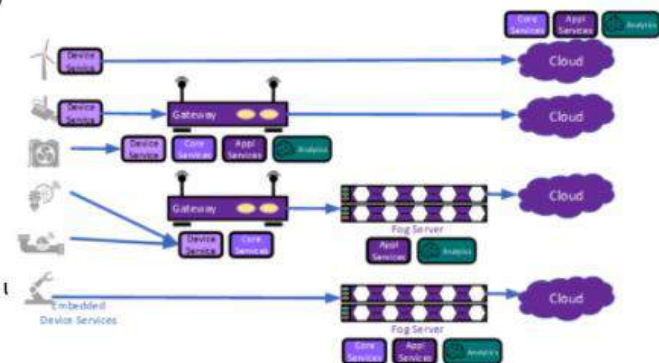
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EdgeX Enables Tiered Fog Deployments

- In today's IoT landscape, it is imperative to leverage compute, storage, network resources where ever they live
- Loosely-coupled architecture enables distribution across nodes to enable tiered edge/fog computing
- Scope includes embedded sensors to controllers, edge gateways and servers
- Quantity and function of micro services deployed on a given node depends on the case and capability of hardware





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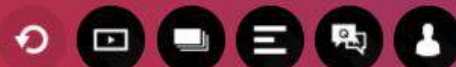
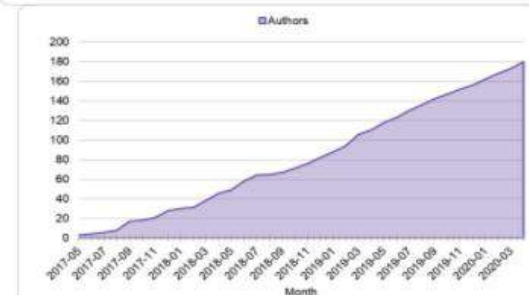
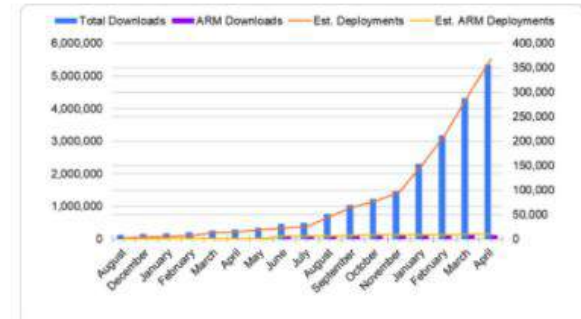
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Project Momentum

- Over 180 EdgeX contributors
- > 5 million container downloads
- > 350K deployments
- ~6K website users a month
- > 170 contributors since founding
- > 35 global contributors per month
- > 200 commits per month





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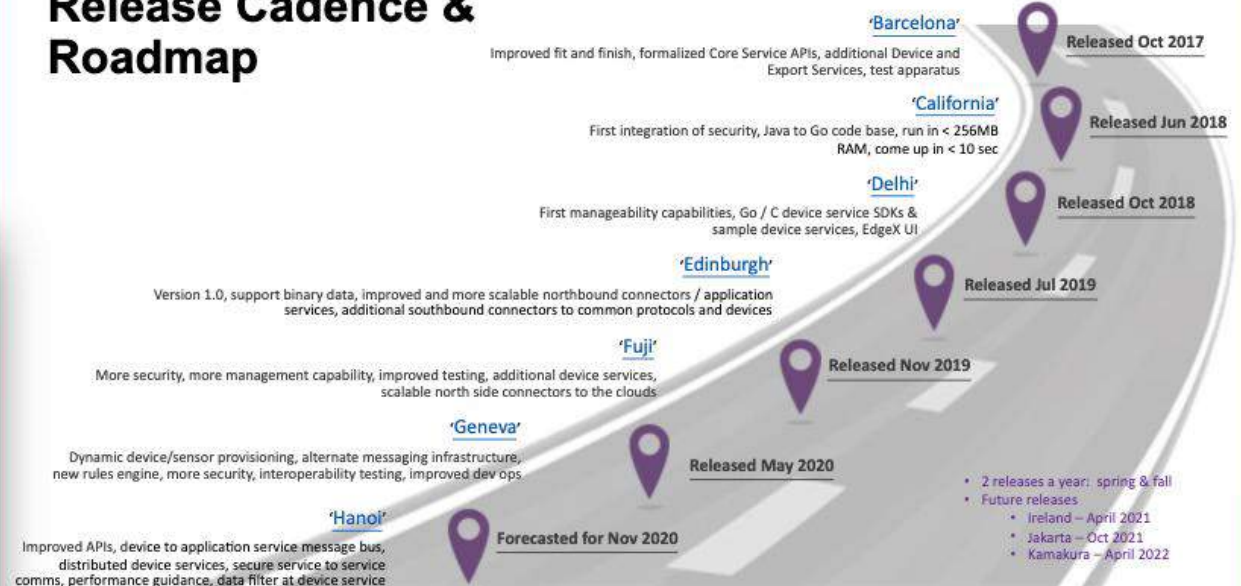


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Release Cadence & Roadmap





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Key Project Links

Access the code:

<https://github.com/edgexfoundry>

Access the technical documentation:

<https://docs.edgexfoundry.org/>

Access technical video tutorials:

<https://wiki.edgexfoundry.org/display/FA/EdgeX+Tech+Talks>

EdgeX Blog:

<https://www.edgexfoundry.org/news/blog/>

Join an email distribution:

<https://lists.edgexfoundry.org/mailman/listinfo>

Join the Slack Channels:

<https://slack.edgexfoundry.org/>

Become a project member:

<https://www.edgexfoundry.org/about/members/join/>

LinkedIn:

<https://www.linkedin.com/company/edgexfoundry/>

Twitter:

<https://twitter.com/EdgeXFoundry>

Youtube:

<https://www.youtube.com/edgexfoundry>





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Project EVE – Building the “Android of the IoT Edge”

Jason Shepherd

LF Edge Board Member and VP Ecosystem, ZEVEDA

#ossummit @defshepherd





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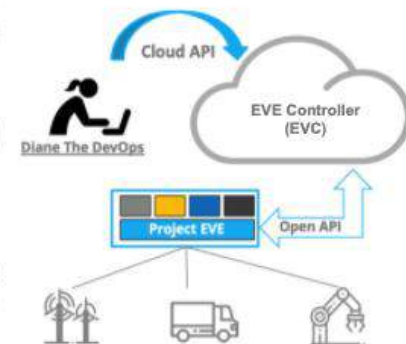
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What is Project EVE?

An open edge computing engine that **simplifies the development, orchestration and security of cloud-native application edge hardware.**

Supporting containers, VMs and unikernels, EVE aims to | **foundation for Industrial and Enterprise IoT edge deployment choice of hardware, applications and clouds.**

Any centralized orchestration controller can take advantage of foundation and **open APIs to abstract complexity and prevent vendor lock-in.**



Visit the [project site](#) for more information





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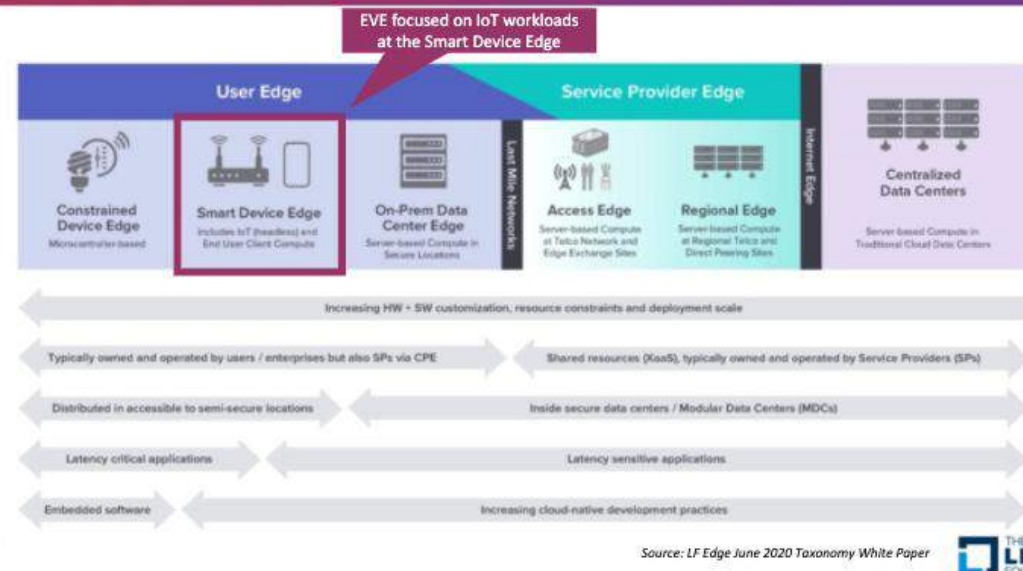


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Why EVE?



#ossna





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EVE Aims to be the Android for the IoT edge

		
App and OS Sandboxing	Containers and hardware-assisted virtualization	JVM
App Bundling	Edge Compute Objects (ECOs)	APK
App Deployment	Remotely deployed by IT/OT	Downloaded locally by end user / remotely deployed by IT
HW Support	x86, Arm (+RISC V), co-processors (e.g. GPU, FPGA) <i>Targeting edge compute nodes with ~256MB+ of available memory up to small clusters</i>	x86, Arm, MIPS

The IoT Edge needs a standard foundation for orchestration and virtualization that is flexible, open and agnostic.





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Comparison of Architectural Approaches

EVE Edge Computing Engine

- › Bare metal foundation enables deep security and networking functionality
- › 100% open orchestration API with vendor-neutral governance through LF Edge
- › Supports both containers and VMs
- › No risk of bricking during updates
- › Optimized for constrained IoT edge compute hardware



VS.

Proprietary Bare Metal

- › Similar story for security, networking and update resiliency
- › API lock-in to proprietary controller
- › Current solutions for IoT edge support either containers or VMs, not both
- › Data center solutions do not work for constrained IoT edge hardware



Agent-based (OSS or Proprietary)

- › Security gaps without investment in OS integration and hardening
- › Risk of bricking during updates
- › Only support containers
- › Proprietary variants create lock-in
- › Can be complementary by leveraging EVE as foundation



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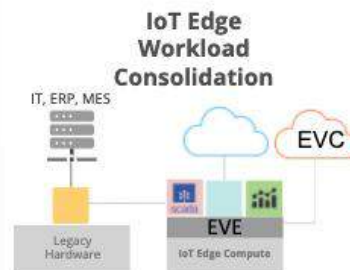


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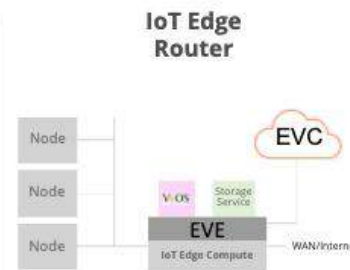
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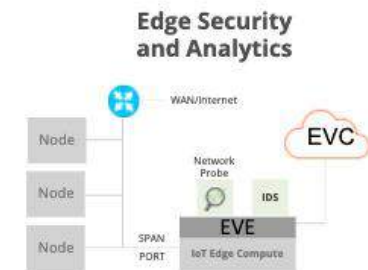
Example EVE Use Cases



- › Extract data for local analysis / cloud and connect to new sensors
- › Consolidate legacy and cloud-native workloads with no interference to existing setup
- › Secure apps with private networks



- › Added security for current/legacy IoT installations
- › Deploy a network proxy application (e.g., MQTT)
- › Add app to update firmware of legacy hardware



- › Deploy and manage security and analytics apps
- › SPAN port collector on network enables non-intrusive, out of band data collection
- › Gain visibility, monitor traffic and trigger events



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Target Project Roadmap for 2020

- › Reduce footprint, increase modularity to support more deployment options
- › Add support for managed containerd and Docker Compose
- › Add support for Kubernetes clustering via K3S
- › Expand hypervisor support (e.g. KVM, ACRN for time-critical workloads)
- › Add mesh networking capabilities for edge-to-edge data flow





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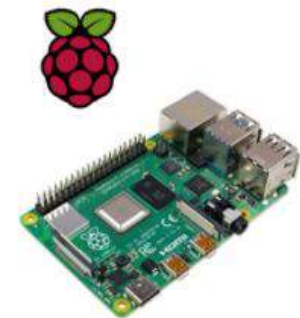
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RPi Support!

- › EVE image now available for RPi 4
- › Includes GPU support
- › Can be used with OSS Adam controller today
- › Stay tuned to "EVE in the Market" page for other supported HW and controller options, or contribute your own!





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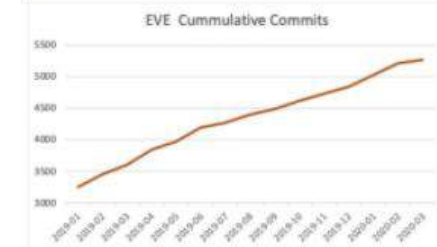
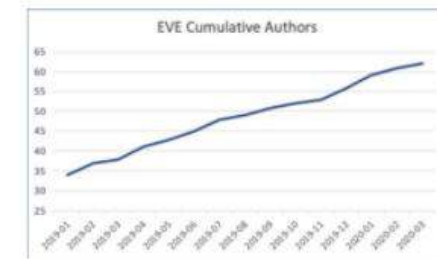
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Community Update

- › Approaching 50 unique contributors including from ZEDEDA, Xilinx, Intel, Global Logic, Atomic, GE Research and Timesys
- › Deployed in several market verticals
 - › Energy: Wind turbines
 - › Healthcare: Hospitals
 - › Industrial: Manufacturing plants
 - › Oil and gas: Wells
- › Working to collaborate with other LF Edge projects and industry efforts





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ABSTRACT

LF Edge Summit is a 90 minute, single-track event on the topic of IoT and Edge Computing. The main goal of this LF Edge event is to provide an overview of the edge projects under the umbrella including Akraino Edge Stack, EdgeX Foundry, Project EVE and more. LF Edge leaders will share insight into what's to come, and discuss Edge business models & use cases. There will also be an Edge Panel: Business model innovations brought by 5G and Edge computing 5G, Edge computing, cloud native, and AI will transform the telco and many vertical industries. These technologies will create many business models that we have not seen before. The current health crisis has created new thinking and how we leverage and apply these technologies to common good. In this panel, we will discuss these technologies, business models, use cases across many industries.

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Key Project Links and Info

- › EVE Calendar - <https://lists.lfedge.org/g/eve/calendar>
- › EVE Wiki: <https://wiki.lfedge.org/display/EVE/EVE>
- › Slack - <https://slack.lfedge.org/#eve>
- › TAC - <https://wiki.lfedge.org/pages/viewpage.action?pageId=1671298>
- › TAC Calendar - <https://wiki.lfedge.org/display/LE/LF+Edge+Group+Calendar>

LF Edge Technical Advisory Committee (TAC) meetings are open to all and held every other Wednesday at 7am PT. Project EVE TAC office hours are on Thursdays. Join us!





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Edge Panel Discussion: Business Model Innovations Brought by 5G and Edge Computing

Kandan Kathirvel, Director, AT&T

Sandip Kamat, Global Product Management, HP

Renu N Navale, Vice President & General Manager, Intel

Sajith Balraj, Director Business Development & Product Management, Qualcomm

Moderator: Balaji Ethirajulu, Senior Director Product Management, Ericsson

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State of the Edge

Matt Trifiro / Vapor IO

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Project Mission

Accelerate the edge computing industry by developing free, shareable research that can be used by all.



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What is State of the Edge?

- Founded in 2017
- Became part of LF in 2020
- Top-level project at LF Edge
- Vendor-Neutral

Founders



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History



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Working Groups

Research



Open Glossary



Edge Landscape



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Home Edge, Fledge, Open Horizon, Baetyl

Arpit Joshipura / The Linux Foundation

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LF Edge Summary

Vision: Our software & projects enable rapid productization of Edge platforms by leveraging end user input to drive and supply the necessary building blocks (and/or frameworks, reference solutions) to facilitate integration and interoperability for Edge Computing across Telecom Service Providers, Cloud Providers, IOT & Enterprises

Projects

IMPACT - STAGE 3



GROWTH - STAGE 2



AT LARGE - STAGE 1



Premier Members



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SLIDES

Project Summary: HomeEdge

Stage 2- Growth, founding project

Concentrates on driving and enabling a robust, reliable and intelligent home edge computing open source framework and ecosystem running on a variety of devices at home. To accelerate the deployment of the edge computing services ecosystem successfully, the Home Edge Project provides users with an interoperable, flexible, and scalable edge computing services platform with a set of APIs that can also run with libraries and runtimes..

Top Use Cases

- › Service offloading in a home environment when device doesn't have required capabilities
- › Distributed computing framework to maintain low latency and high data privacy

Technical Summary

- › Device/Service Management : Device/Services which are in home network are discovered and managed based on their service capabilities.
- › Service Offloading : Low end devices request high end devices to perform computing on behalf of them using the scoring manager.
- › Scoring Manager : Helps to pick a right device to perform service



Project Release Status (as of Q12020)

- › Baobab (Oct 2019) with Device/service discovery, Service offloading was released
- › Coconut(Oct 2020) is planned with VPN, Data Storage modules



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ABSTRACT

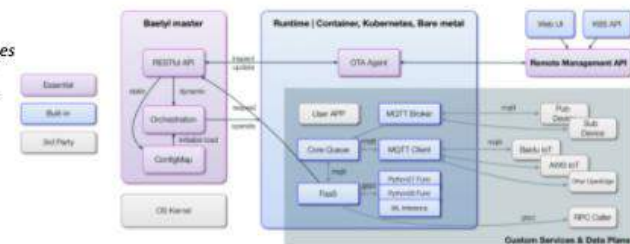
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Project Summary: Baetyl

Stage 1-At Large

Baetyl offers a general-purpose platform for edge computing that manipulates different types of hardware facilities and device capabilities into a standardized container runtime environment and API, enabling efficient management of application, service, and data flow through a remote console both on cloud and on prem.



Top Use Cases

- › Light, secure, and scalable edge applications
 - › On drone processing
- › AI/ML- Allows for processing at the edge, reducing latency
 - › Quality Inspection by AI via video images
- › Automated/Zero touch onboarding- remote management

Technical Summary

- › Works with x86, arm, MIPS and OS agnostic
- › Services to speed development
 - › Video Ingress Service, ML Inference as a Service
- › For unstable Networks- has local persistence

Project Release Status (as of Q12020)

- › Baetyl as a Container- Mid 2020
- › Remote Management- APIServer: Certification, application config & OTA Mid 2020



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Project Summary: Fledge

Stage 1- At Large

Fledge is an open source framework and community for the Industrial Edge. Architected for rapid integration of any IIoT device, sensor or machine all using a common set of application, management and security REST APIs with existing industrial "brown field" systems and clouds.

Top Use Cases

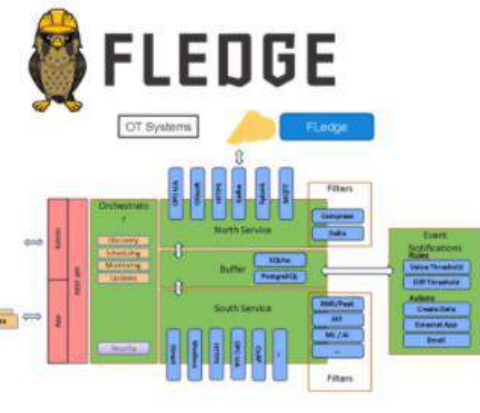
- › Eliminate route based monitoring and deploy modern condition based monitoring, predictive maintenance and situation awareness in industrial plants, mines and factories.
- › Integrate IIoT with existing OT systems (no data silos)
- › Edge based anomaly detection, machine learning and AI to determine machine state and/or part quality.

Technical Summary

- › Pluggable microservices based architecture to rapidly connect any new or legacy machine, sensor or PLC using Python or C.
- › Easily build REST based applications and services that aggregate, buffer, transform, analyze and deliver machine data from sensors to any/all OT systems and clouds.
- › Consistent IIoT management and security APIs to scale up and out

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<https://wiki.lfedge.org/display/FLEDGE/Fledge+Home>



Project Release Status (as of Q12020)

- › Deployed in manufacturing, energy, water/waste water, and oil and gas operations since Q1 2019.
- › Release 1.8 March 30, 2020
 - › ML/AI Tensorflow Support
 - › Google Cloud North
 - › Vibration Data Management 8000khz
 - › New mgt/security API



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Project Summary: Open Horizon

Stage 1- At Large

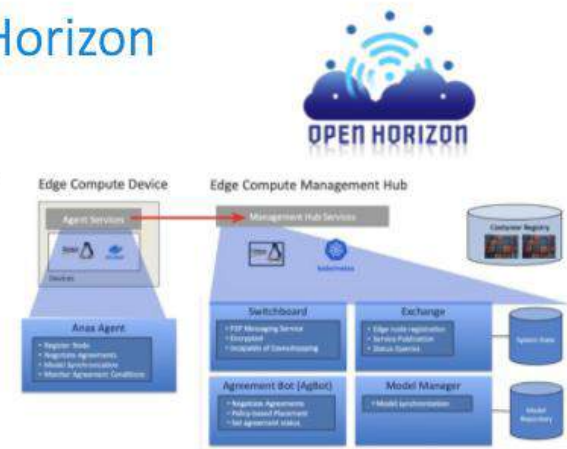
Open Horizon is a platform for managing the service software lifecycle of containerized workloads and related machine learning assets. It enables management of applications deployed to distributed hyperscale fleets of edge computing nodes and devices without requiring on-premise administrators.

Top Use Cases

- › Management of ML models and containerized workloads on constrained devices

Technical Summary

- › Provides a policy-based mechanism to securely deliver containerized workloads to edge compute nodes of varying sizes and capabilities and in various connected states.
- › Fully autonomous agent runs on every edge device to enable orchestration and manage the lifecycle of your containers
- › Autonomous Agreement Bots (agBots) monitor each edge node
- › Model Manager automatically syncs assets bi-directionally based on policy



Project Release Status (as of Q22020)

- › Launched Q2 2020 with LF Edge and incubated with LF Edge's EdgeX



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LF Edge: Key Takeaways

1. Harmonizing Open Source Edge Communities across IOT, Enterprise, Cloud & Telecom
2. Keeping LF Edge Open & Interoperable with
 - › Hardware, Silicon, Cloud, OS, Protocol independence
 - › Bringing the best of telecom, cloud and enterprise – location, latency & mobility
 - › In collaboration with Consortiums/SDO (IIC, AECC, OEC, ETSI)
3. Hosted by the Linux Foundation similar to other Open Source Communities like CNCF (Kubernetes), LF Networking (ONAP) and many more.

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Get Involved in the LF Edge Technical Communities

- › Participation in LF Edge Projects is open to all
- › Getting involved in the technical communities is the best way to learn
 - › **Step 1:** Get a Linux Foundation ID Here: <https://identity.linuxfoundation.org/>
 - › **Step 2:** Visit LF Edge Wiki (<https://wiki.lfedge.org/>)
 - › **Step 3:** Join workflows for the projects and working groups, subscribe to mailing lists, ask questions, contribute!



Way to participate:

- | | | |
|---------------------------|----------------------------------|----------------------------------|
| › Attend project meetings | › Analyze requirements | › Provide feedback through VSFG |
| › Attend developer events | › Define tests / processes | › Host and staff a community lab |
| › Join approved projects | › Review and submit code patches | › Answer questions |
| › Propose a project | › Build upstream relationships | › Give a talk / training |
| › Write documentation | › Contribute upstream code | › Create a demo |
| | | › Evangelize LFF and its |

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Q&A

