



The Power of Together

# Antitrust Policy Notice

Linux Foundation meetings involve participation by industry competitors, and it is the intention of the Linux Foundation to conduct all of its activities in accordance with applicable antitrust and competition laws. It is therefore extremely important that attendees adhere to meeting agendas, and be aware of, and not participate in, any activities that are prohibited under applicable US state, federal or foreign antitrust and competition laws.

Examples of types of actions that are prohibited at Linux Foundation meetings and in connection with Linux Foundation activities are described in the Linux Foundation Antitrust Policy available at <http://www.linuxfoundation.org/antitrust-policy>. If you have questions about these matters, please contact your company counsel, or if you are a member of the Linux Foundation, feel free to contact Andrew Updegrove of the firm of Gesmer Updegrove LLP, which provides legal counsel to the Linux Foundation.

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Examples of typical connection with the Antitrust Policy include:

- Questions about whether a particular meeting is a "競爭性會議" (competitive meeting) under Chinese antitrust law.
- Questions about whether a particular meeting is a "聯合會" (cartel meeting) under European Union antitrust law.
- Questions about whether a particular meeting is a "聯合會" (cartel meeting) under US antitrust law.

The Linux Foundation is a **pre-competitive** platform that enables cooperation and leveraged development.

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Remove carbon from our **power, buildings,**  
and **transportation** systems to provide **75%**  
**of the reduction in CO<sup>2</sup> emissions** that we  
need to stay below 1.5°C

# Design Challenge

Not enough time

Not enough resources

We need interoperability

And, no vendor lock-in

A photograph of a bright sun in a blue sky, partially obscured by white clouds. The sun's rays create a lens flare effect.

Providing a 21st century plan of action to decarbonization through open source, open frameworks, reference architectures, and a support ecosystem of complementary projects.

# LF Energy Members

## Strategic



## General



**HITACHI**  
Inspire the Next



## Associate

Carbon Co-op



EPRI  
ELECTRIC POWER  
RESEARCH INSTITUTE



Lucerne University of  
Applied Sciences and Arts  
HOCHSCHULE



The  
Alan Turing  
Institute



WASHINGTON STATE  
UNIVERSITY

# LF Energy Projects (+1)



# LF Energy Project growth



2018



2019



2020



2021

# Forecasting Exponential Growth



OCPP Cloud  
Connector



100s of projects  
R & D Sandboxes  
A thousand members  
10s of thousands of developers

2022

2023

2024

2025

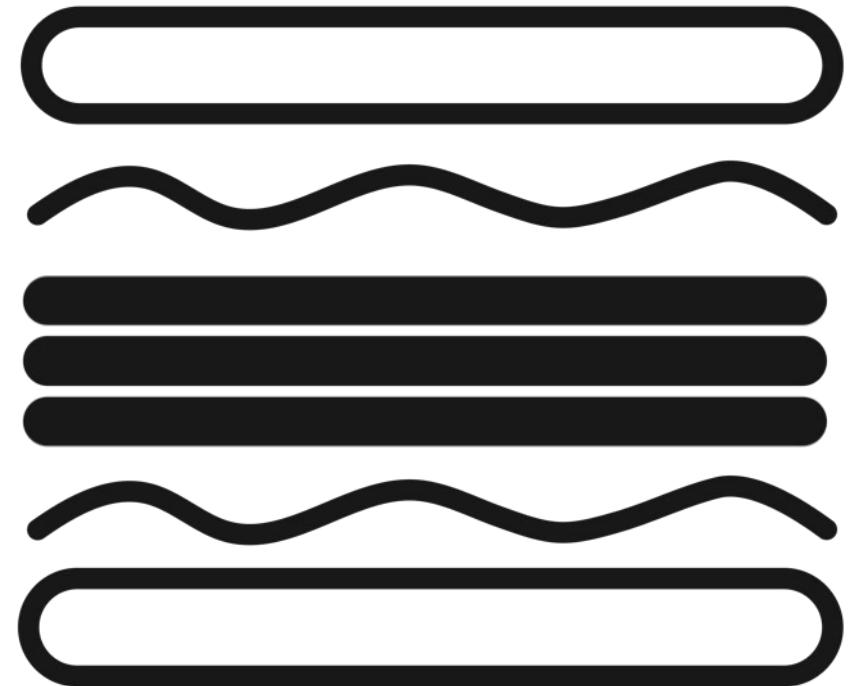


THE  
**LINUX**  
FOUNDATION



**Open Source**  
is simply defined as a permissive IP license  
that enables shared investment  
and leveraged development

# Today open source generally comprises 80-90% of a modern system's total codebase



Use Open Source  
Libraries to Solve Problems  
**Open Source Code (~70%)**

Write Custom Code  
**Custom Code (~10%)**

Choose a Reference  
Implementation  
**Open Source Code (~20%)**

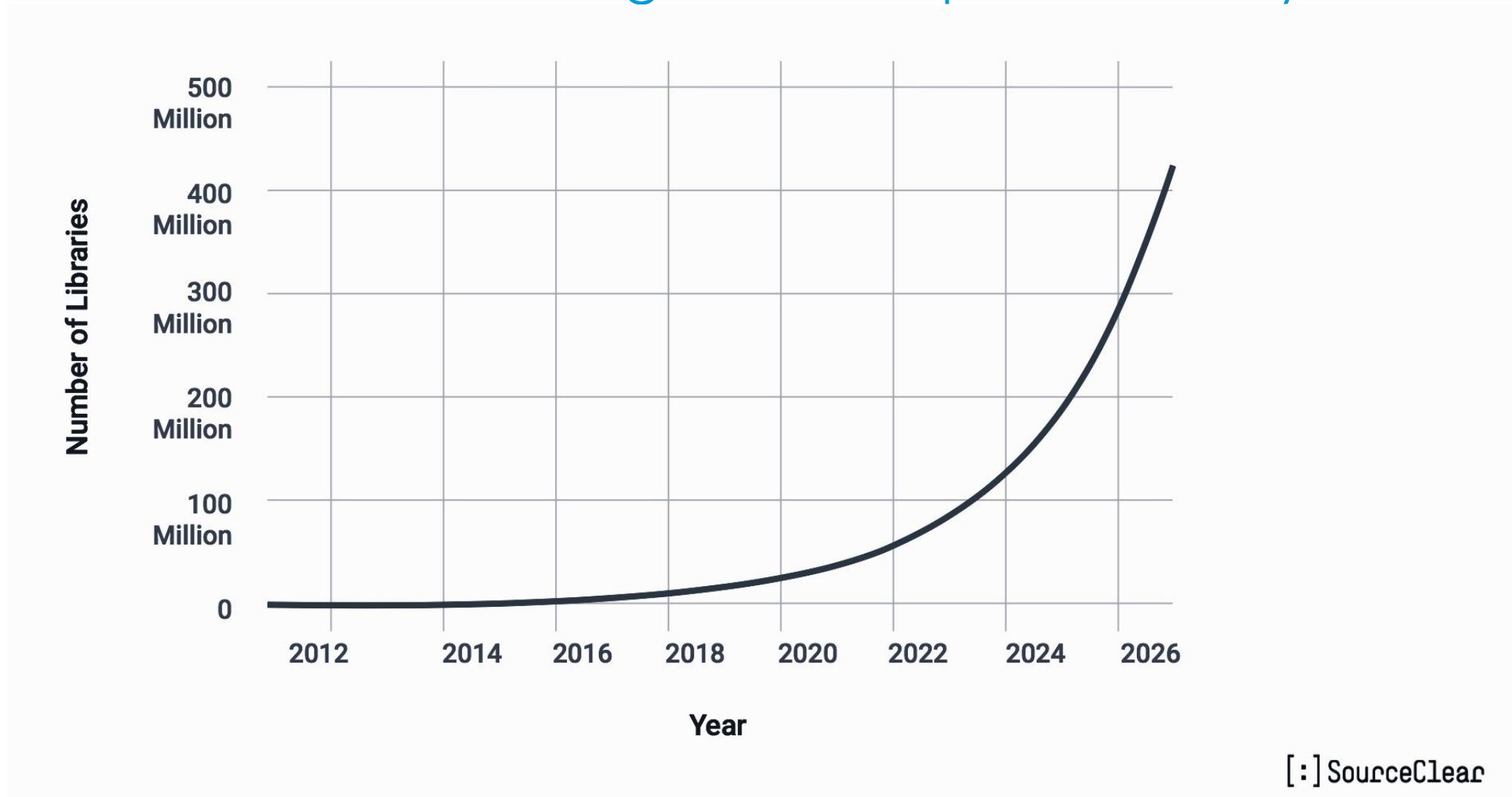
# Hundreds of monitored projects, 1B lines of code



<b>24.4M</b> Lines of Code Added Weekly	<b>14.4M</b> Lines of Code Removed Weekly	<b>722,330</b> Technical Contributors	<b>118,556</b> Ecosystem Contributors	<b>12,925</b> Contributing Companies
<b>12.2M</b> Commits	<b>1.4M</b> Pull Requests	<b>2.1M</b> Builds Monitored	<b>933,150</b> Logged Issues	<b>11.2B</b> Container Downloads
<b>4.4M</b> Email Messages	<b>5.1M</b> Chat Messages	<b>32,517</b> CLA Contributors	<b>82,939</b> Event Attendees (12 months)	<b>1100+</b> Project Domains
				<b>28,028</b> Community Meetings

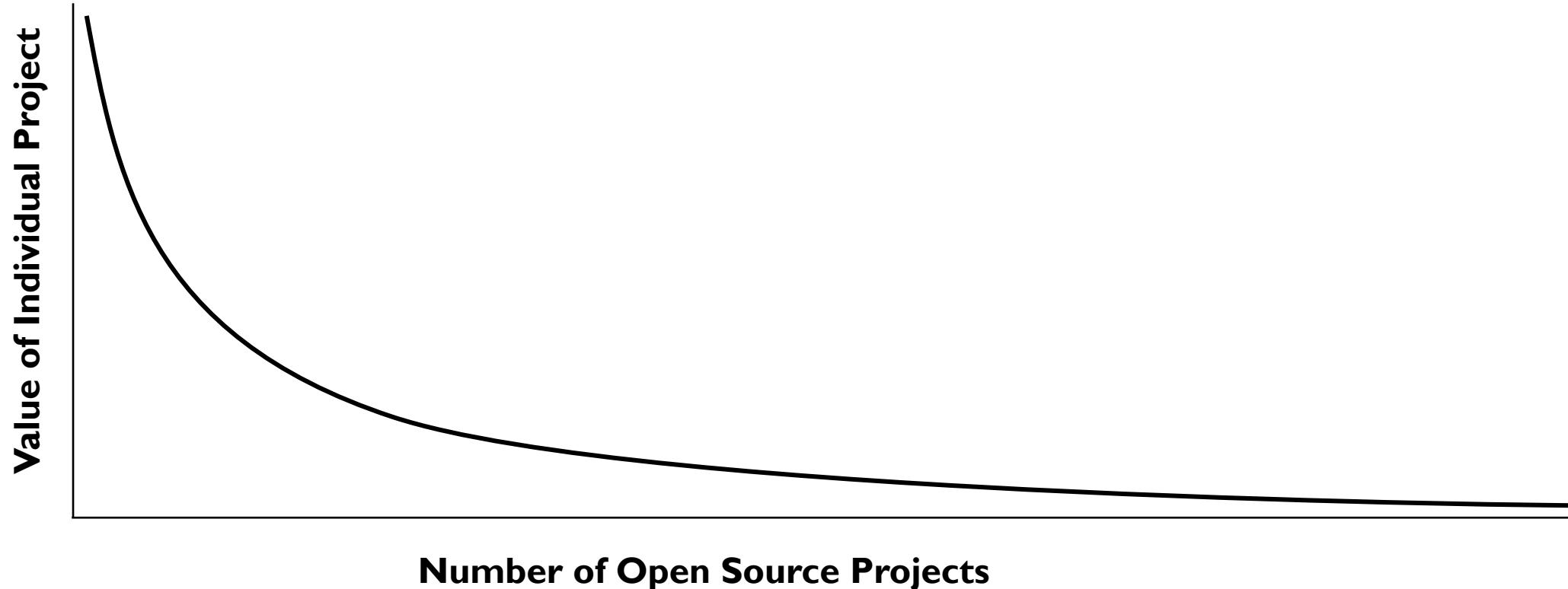
The Power of Together

Open Source is on an exponential growth curve, developers use it as a universal building block for production systems

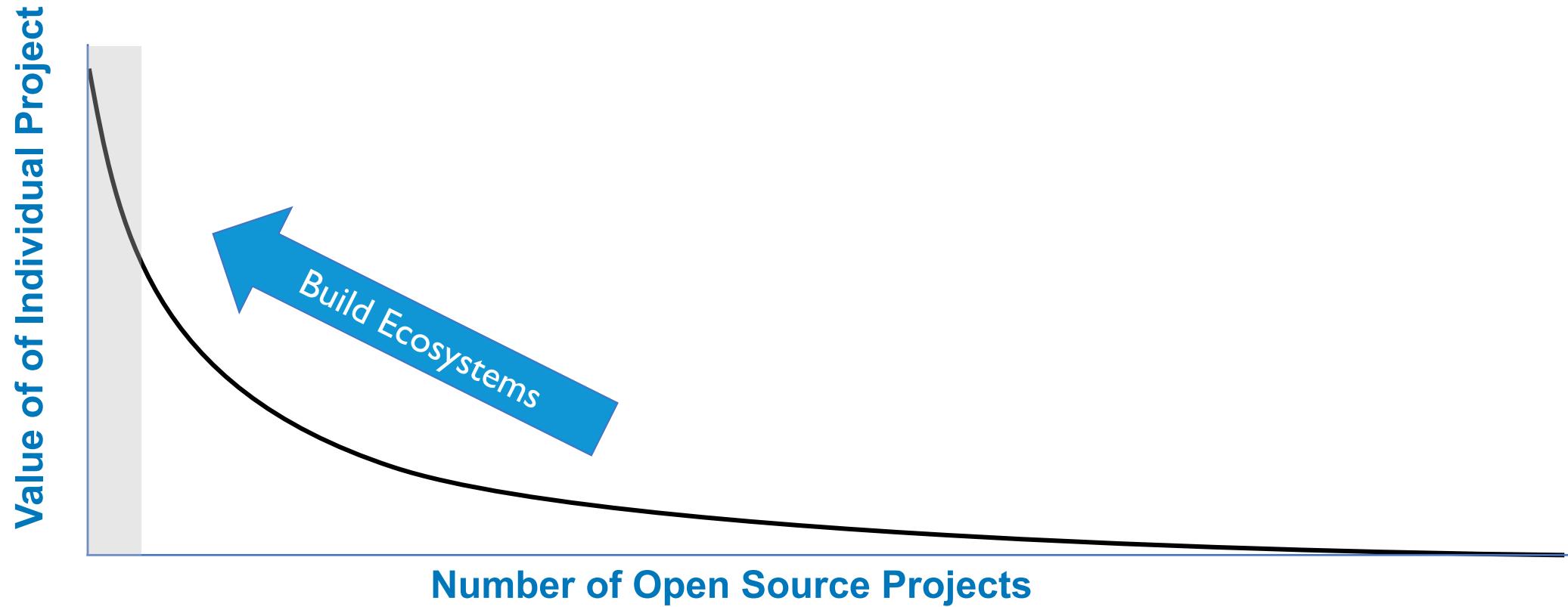


[:] SourceClear

There are millions of open source projects and growing. But not all projects are the same

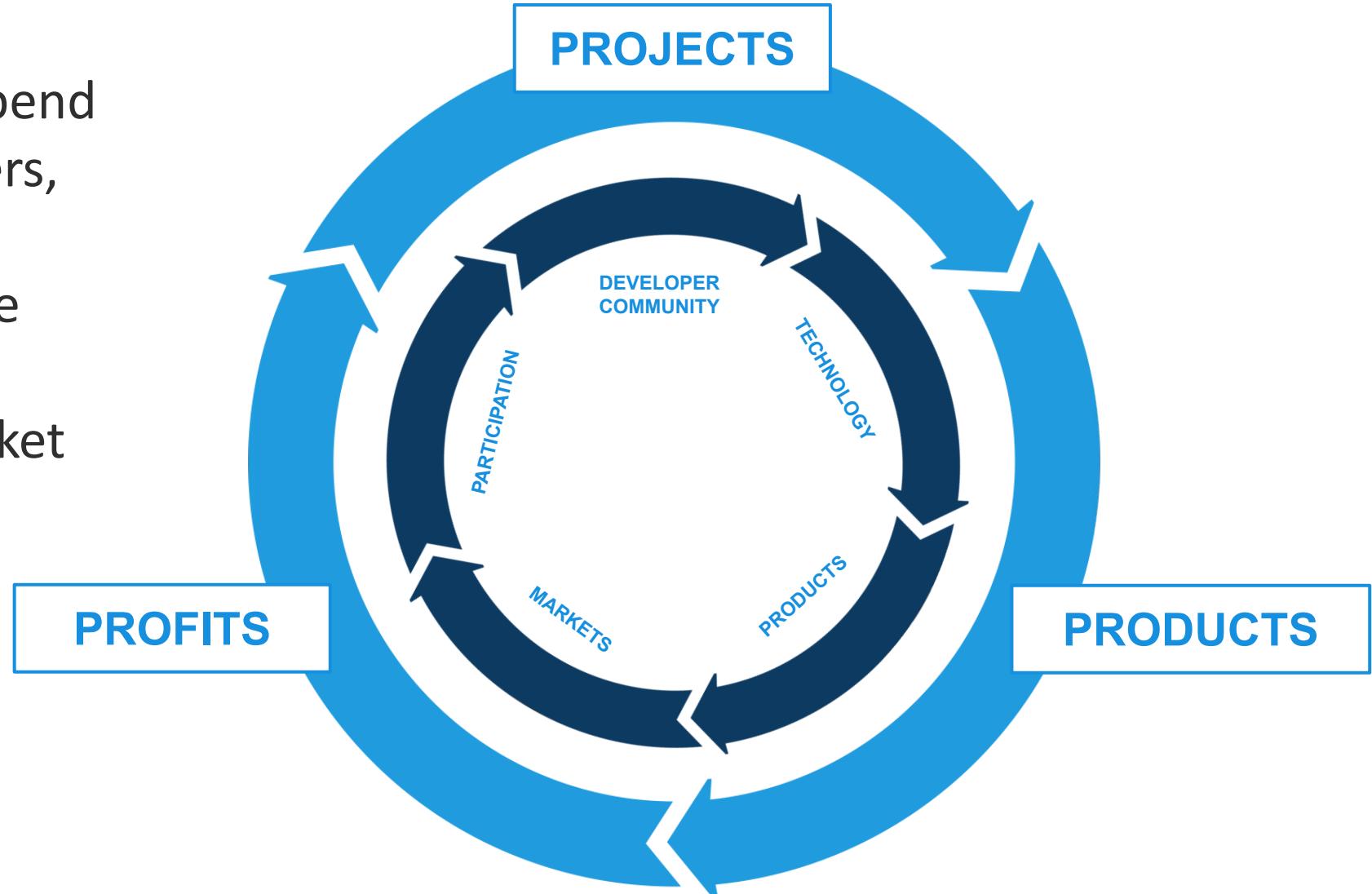


Projects that are **critical to society and industry**  
need healthy, neutral ecosystems



# Our goal is to ignite a positive feedback loop of sustainability

Successful projects depend on members, developers, standards, and infrastructure to enable commercialization pathways that the market will adopt



# The Linux Foundation provides unparalleled ecosystem support

## Support and Resources

### Self Service

- FAQ
- Forum
- Knowledgebase
- Onboarding

### Community/Responsive

- Slack/IRC
- Email
- Stackoverflow
- IT operations/Release Mgmt

## IT Beyond Version Control

- CI/CD technical architecture design
- CI environment delivery
- Release engineering services
- Project planning, build & system go-live
- Delivery of project collaboration solutions, domain registrations & websites

## Marketing Programs

- Advocate/Influence Programs
- Rewards/Recognition
- Startup/Incubator Engagement
- Student programs
- PR/AR

## Content

### Technical

- Code samples
- Getting started guides
- How to's/FAQ
- API/SDK

### Research

- Use cases/Case Study
- Whitepapers
- Blogs
- Webinars
- Articles

## Value

- Define problem project/code solving
- Recruit widely deployed projects/communities
- Curate projects with natural adjacency to existing project
- Demonstrate where project fits in to broader tech innovation

## Neutral Management

- Provide home for IP assets
- Define a governance structure for decisions
- Separate business decisions from technical
- Curate sense of identity superseding individuals or firms
- Maintain IT infrastructure

## Developer Recruitment and Relations

### In person

- Meetups
- Events
- Hackathons
- 3<sup>rd</sup> Party Events
- Evangelism

### Online

- Email lists and calls/meetings
- IRC/Slack
- Github, Gitlab, etc.
- Stackoverflow
- 3rd party repos

## Training

### Engage

- Massive Open Online Course (EdX)
- Webinars
- Snackable learning

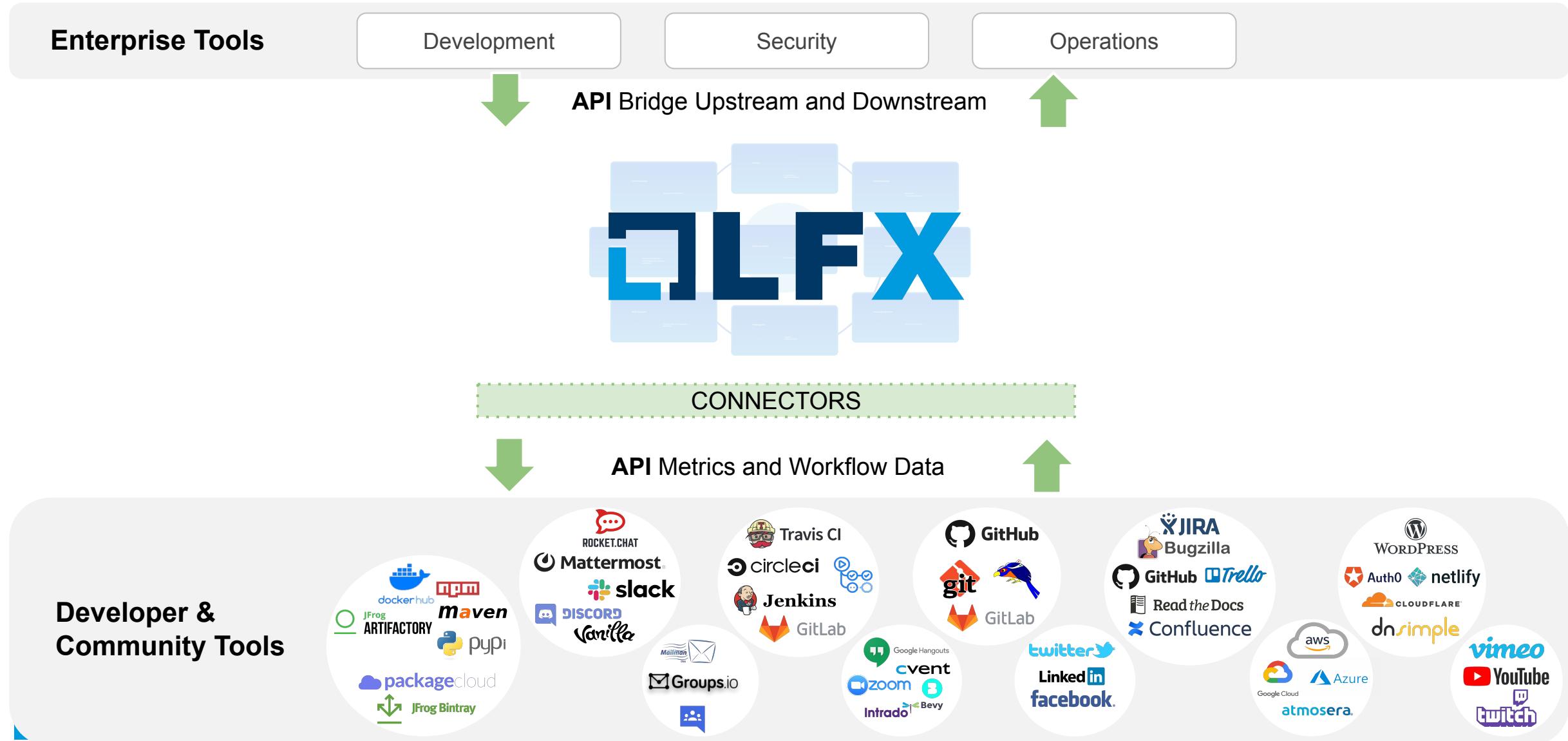
### Train

- eLearning
- Classroom learning
- Subscription learning

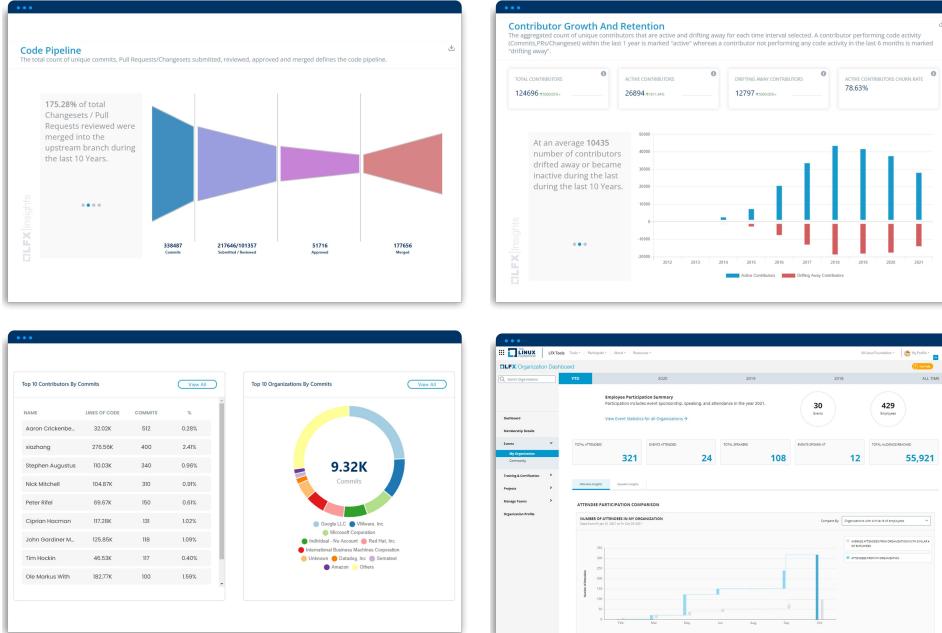
### Certify

- Skills based testing
- Ongoing engagement

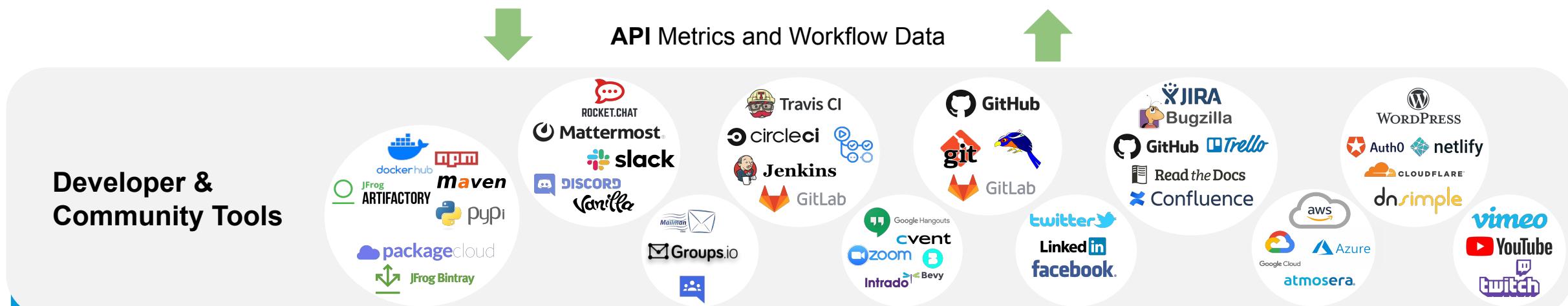
# What enables our success is the LFX platform - designed from the ground up for scale and extensibility



# Focused on impact & outcomes while being non-intrusive to development process



- ✓ Identify developer pipeline bottlenecks
- ✓ Measure and reduce contributor churn
- ✓ Benchmark against leaders
- ✓ Measure reach at events
- ✓ Analyze social media outreach
- ✓ Drive investments to improve security



Watch this short overview video on LFX



Our highest concern?

Institute tooling that supports secure coding practices

# What impacts code security?

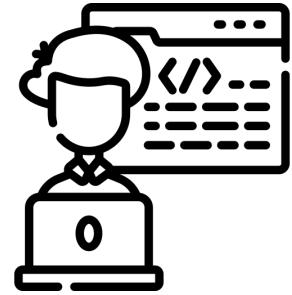
Most project maintainers are **not** security experts



Project Maintainers simply do not have the time to focus on code security – which includes finding and fixing vulnerabilities

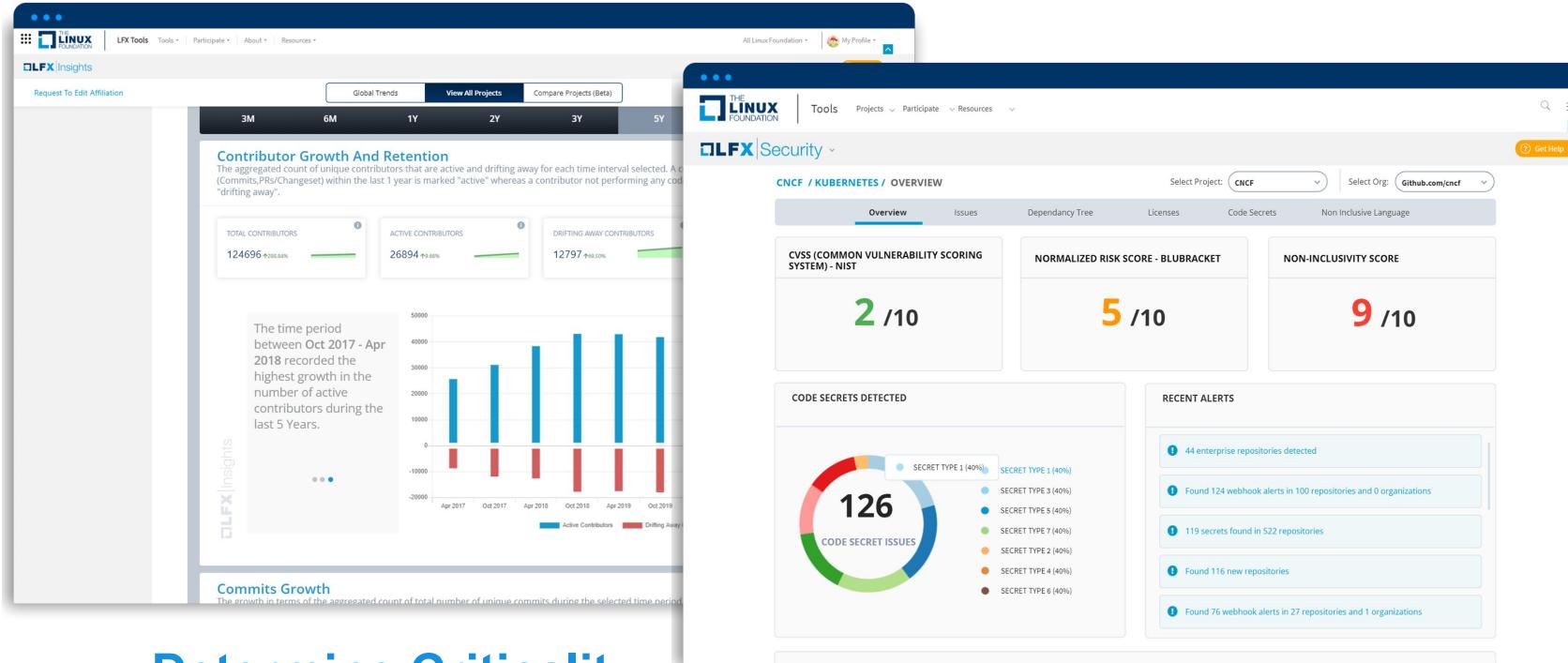


Identifying and activating the security engineers needed to address code vulnerabilities is very difficult for most Project Maintainers.



Maintainers understand that code security is important – but priority is given to project functionality and not on a mature security posture.

# How we are addressing this challenge with LFX?

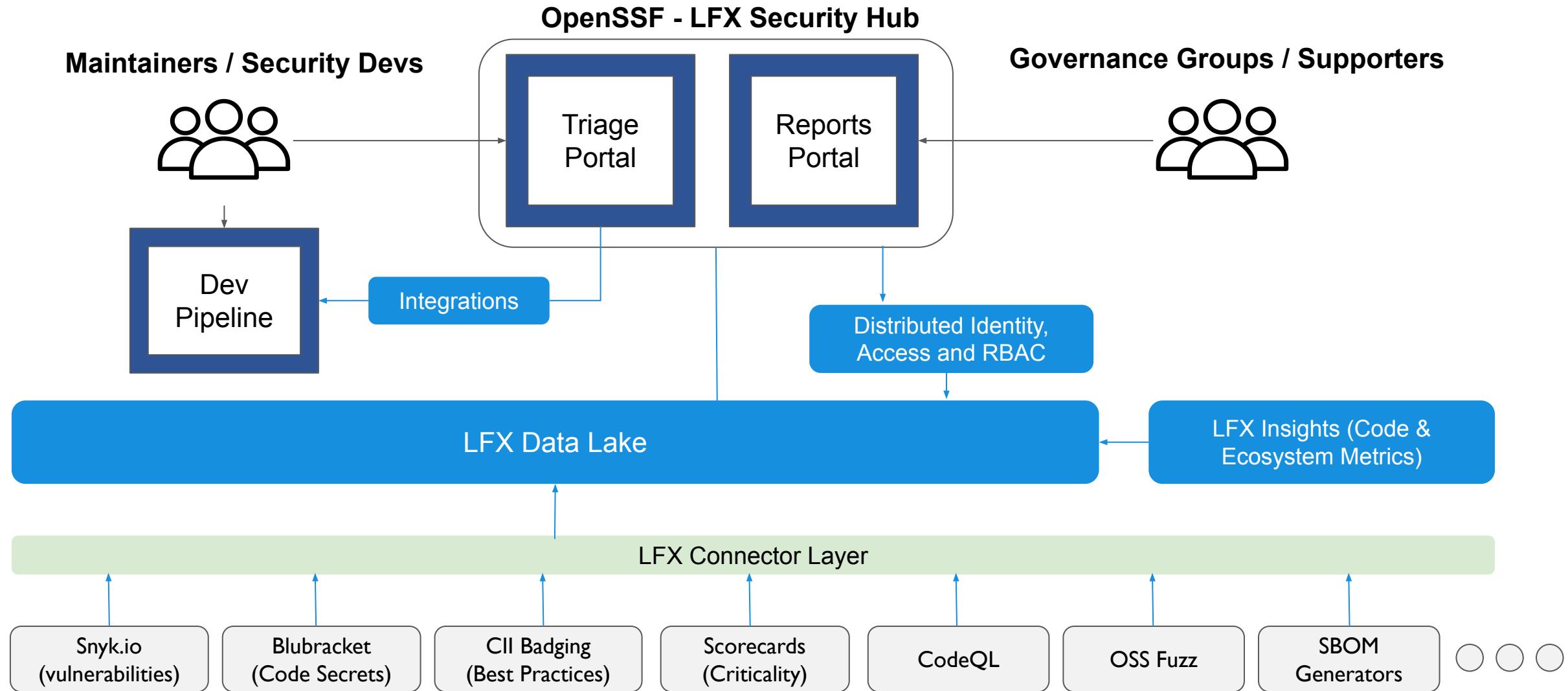


Determine Criticality  
*LFX Insights*

Prioritize Real Issues  
*LFX Security*

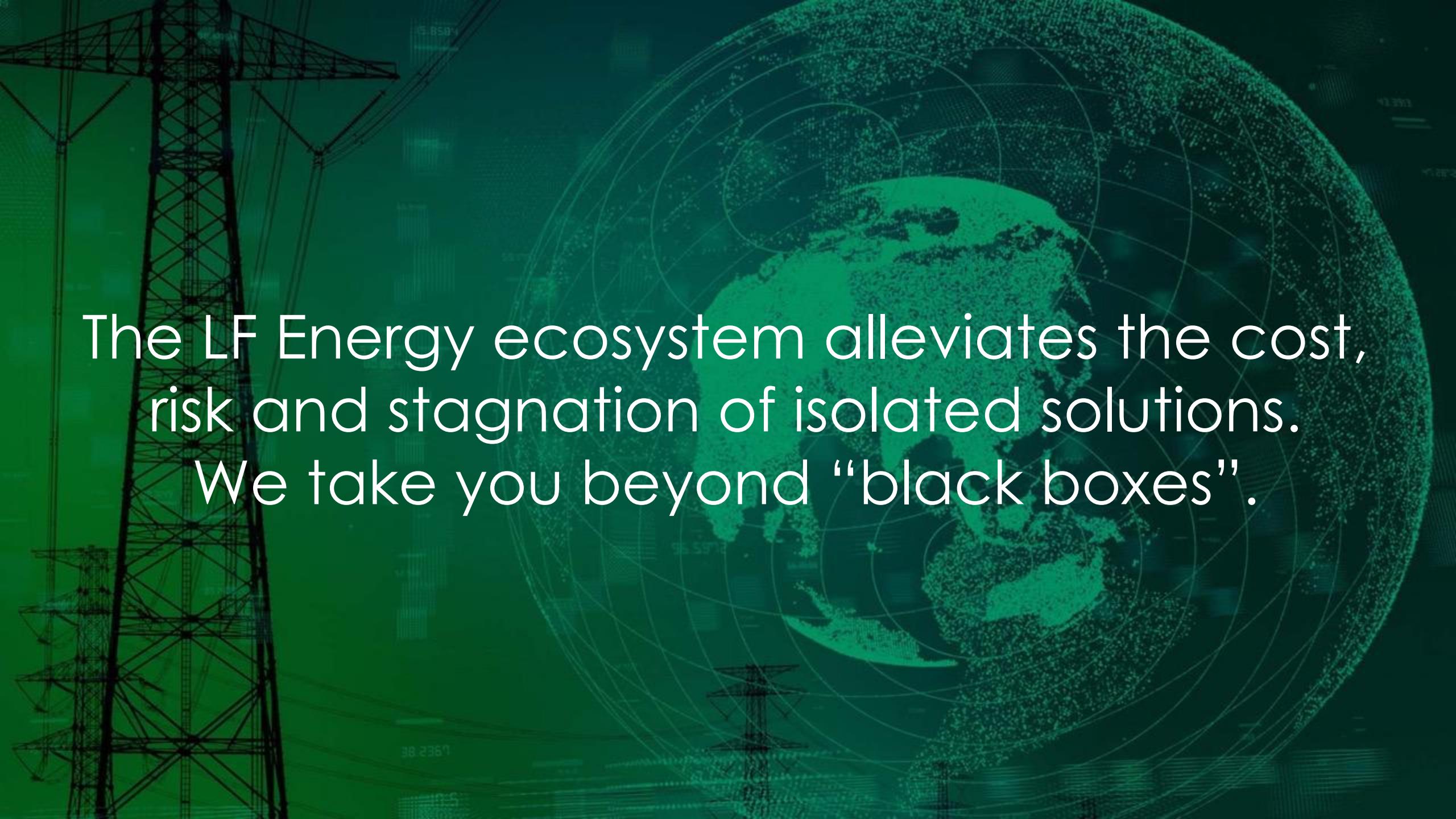
Drive Results With Investment  
*LFX Crowdfunding*

# Through LFX Security, LF Energy leads with Secure by Design



Watch this short video on LFX Security

[https://drive.google.com/file/d/1u4QwvZeWVAN6AiYP42B7  
wp9DUAmu4NDW/view?usp=sharing](https://drive.google.com/file/d/1u4QwvZeWVAN6AiYP42B7wp9DUAmu4NDW/view?usp=sharing)



The LF Energy ecosystem alleviates the cost, risk and stagnation of isolated solutions.  
We take you beyond “black boxes”.



Isolation and going  
it alone are no longer viable.



We need speed, scale,  
enhanced security, accelerated  
innovation, and global talent.

A photograph of a massive flock of birds, likely starlings, captured in flight against a warm, orange and yellow sunset sky. The birds are concentrated in the upper half of the frame, forming a dense, swirling mass. In the lower right corner, the dark silhouettes of bare trees are visible against the bright sky.

We need mass collaboration.

# LF ENERGY



## OUR COMMITMENT

To achieve our climate and energy transition goals we have joined together to create a common functional architecture defining a fit-for-the-future grid. Our goal is a common understanding of required functional capabilities. The architecture starts with a top-level view and progresses to a finer granularity. The final slide shows existing and near-future LF Energy projects fits into this architecture.

This is a start. We want your feedback and involvement. With this we proclaim a commitment under LF Energy to find shared strategic dependencies. By utilizing open source we can accelerate a technology revolution that enables rapid decarbonization by digitalizing the global energy grid. We see that cooperation and working together is the only path to individual and collective success.

Join us.

Capabilities related to customer and markets and other third parties

Capabilities related to managing the physical flow and balance of a power system

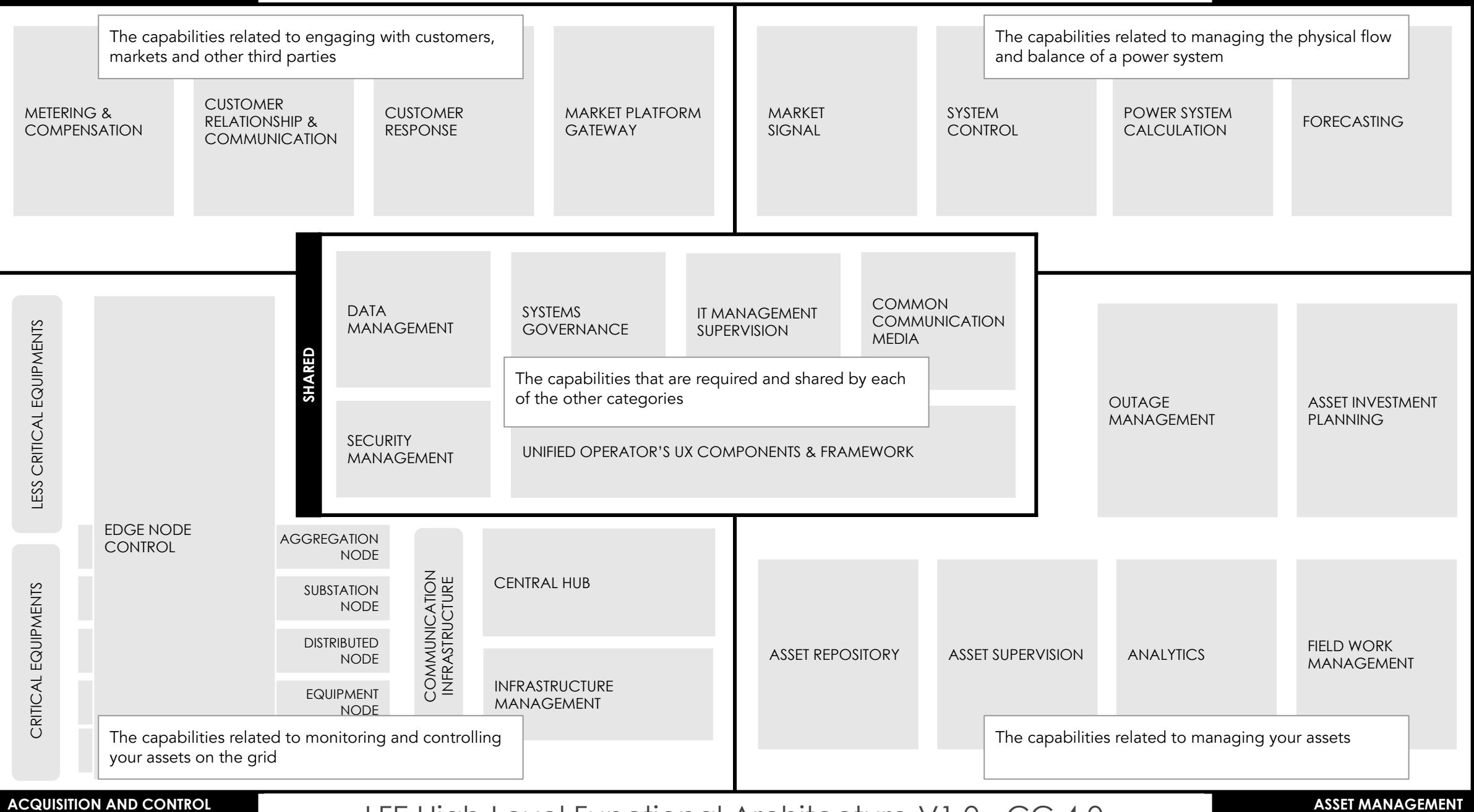
This is the top-level view that shows the five main “blocks” of the functional architecture that we also call categories.

SHARED

Capabilities that are required by each of the other categories

Capabilities related to monitoring and controlling your assets on the grid

Capabilities related to managing your assets



# This is the framework for the LF Energy Application Catalogue

CUSTOMER & MARKET

SYSTEM MANAGEMENT

**CUSTOMER RELATIONSHIP & COMMUNICATION**

- Acquisition, system design, pricing
- Notification & communication management
- Emergency & crisis management
- Customer app/UX/UI
- Contract
- Consent management

**METERING & COMPENSATION**

- Metering
- Compensation/ Settlement
- Billing

**CUSTOMER RESPONSE**

- Smart Ledgers
- Smart contract
- Customer Preferences

**MARKET PLATFORM GATEWAY**

- Power Exchange
- Capacity platform
- Balancing market
- Availability
- Cross border capacity
- Services

**MARKET SIGNAL**

- Cross border capacity calculation
- Adequacy assessment
- Balancing mechanisms
- Aggregated service organization: generators / Storage / site optimization

**SYSTEM CONTROL**

- Remote operation
- System automation
  - centralized automation
  - power quality and system stability
  - autonomous function conf
  - Schedules

**POWER SYSTEM CALCULATION**

- Modeling
- Model exchanges
- State estimation
- Simulation
  - static & dynamic calculation
  - security analysis
  - dispatch / adequacy calculation

**FORECASTING**

- Area Demand
- Solar/Wind Resource
- Generation
- System services
- Local/site balance
- International Exchange
- Market prices

LESS CRITICAL EQUIPMENTS  
Sensor | Protection | Actuator

**EDGE NODE CONTROL**

- Protocol conversion
- Aggregated / distributed / local automations:
  - synchronization
  - Balance & frequency control
  - Monitoring & control
  - Congestion mgt
  - Power quality mgt
  - Outage mgt
  - Storage mgt
  - Demand response mgt

- Aggregated / distributed / virtualized equipment protections
- Failures recording
- Measuring, metering , altering, sensing & actuation
- Logging
- Configuration
- Equipment communication

**DATA MANAGEMENT**

- Long term storage
- Message queues
- Data validation

**SYSTEMS GOVERNANCE**

- Self-registering
- Self-healing
- Alignment with regulations and standards

**IT MANAGEMENT SUPERVISION**

- Network administration
- Service administration
- Threat Monitoring

**COMMON COMMUNICATION MEDIA**

- Emergency & crisis management
- Message queuing – services, directory

**AGGREGATION NODE**

**SUBSTATION NODE**

**DISTRIBUTED NODE**

**EQUIPMENT NODE**

**CUSTOMER SIDE NODE**

COMMUNICATION INFRASTRUCTURE

**CENTRAL HUB**

- Protocol conversion
- Cross-device / vendor & cross-telecom network compatibility
- Data acquisition and treatment
- Short term persistency
- End to End Encryption / KEYS

**INFRASTRUCTURE MANAGEMENT**

- Remote equipment and node mgt.
- Remote configuration mgt.
- Commissioning & installation mgt

**ASSET REPOSITORY**

- Power equipment repository
- Digital infrastructure repository
- Configuration tools
- Configurations and settings repository
- DBoM/SBoM

**ASSET SUPERVISION**

- Real time monitoring
- Log analysis
- Asset performance management
- Asset planning
- Asset lifecycle mgt

**ANALYTICS**

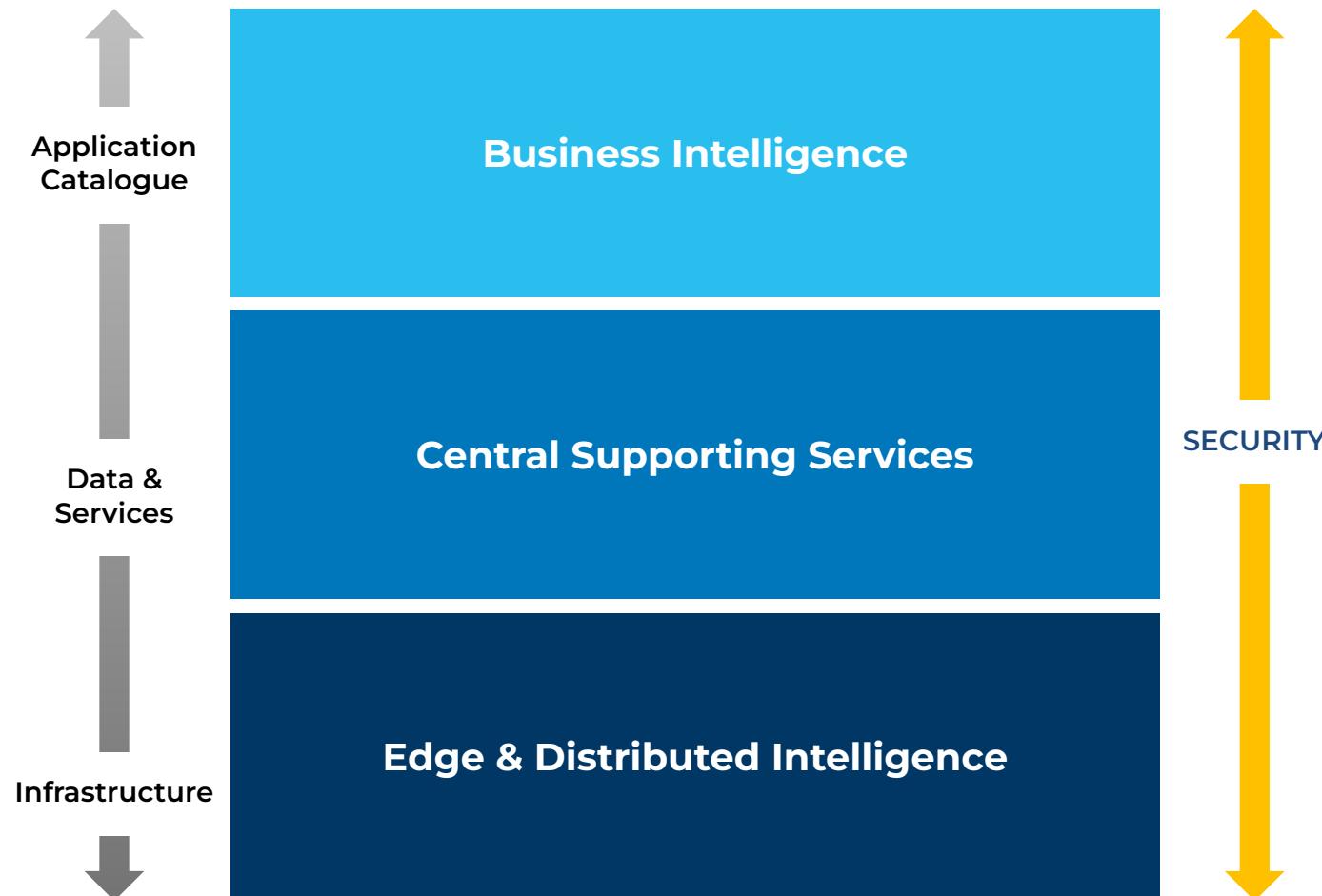
- Health index computation
- Digital twin
- Predictive analytics
- Deep learning
- Simulation

**FIELD WORK MANAGEMENT**

- Safety rules implementation
- Team planning + scheduling
- Supply chain

ACQUISITION AND CONTROL

ASSET MANAGEMENT



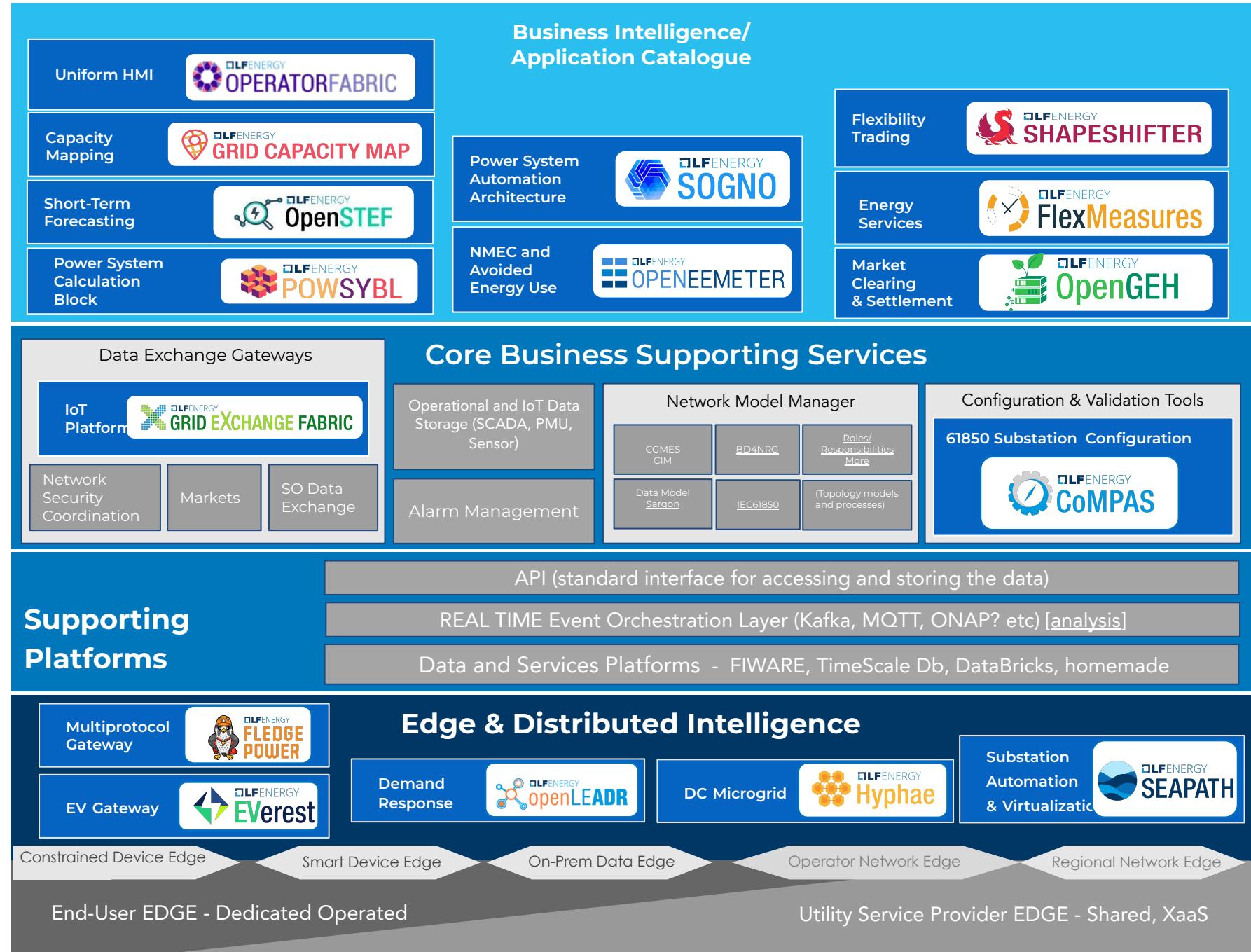
Application Catalogue

Data & Services

Infrastructure

SECURITY

For more background on Edge see [this](#).



# Better security practices in projects

**2020**

1. OpenSSF Badging introduced to all existing projects

**2021**

2. Project Lifecycle strengthened to require OpenSSF Badges at different stages

- Incubation: Passing
- Early Adoption: Silver
- Graduated: Gold

**2022**

3. License Scanning Service added with all projects having SBOMs built on a regular basis

4. LFX Security and Insights enabled for all projects

5. Focus on project maturity, which will bring projects to have higher levels of OpenSSF badges

6. Third-party security audit funding for Graduated Project (pending funding)

# LF Energy can host three sorts of projects

1. Open Source software
2. Open specifications using either the [Joint Development Foundation](#) framework or the [Community Specification 1.0](#)
3. Open hardware design using the Community Specification 1.0

# Other areas of focus - research, training, case studies, policy



THE LINUX FOUNDATION | Research    LFE ENERGY    THE LINUX FOUNDATION | Training & Certification    ESR Energy Research Center | RWTH AACHEN UNIVERSITY

## LF Energy Seeks Partners in Upcoming Research Study on Transformation Readiness of System Operators

January, 2021

### OVERVIEW

A fundamental part of meeting the objectives of the United Nations Climate Conference will depend on the acceleration of power system network transformation.

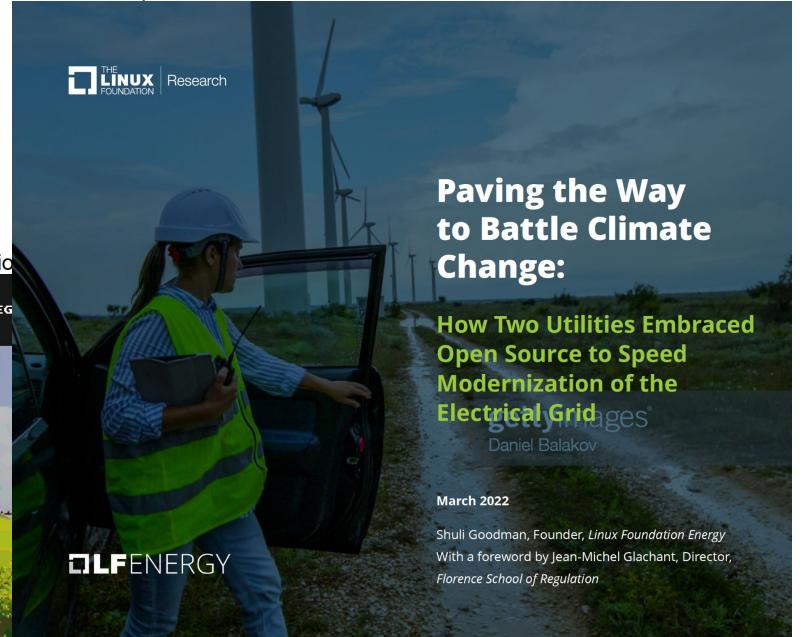
**ets22**

GET INVOLVED   EVENTS   ZPRYME   SPONSORS   REGISTRATION

**ets22**  
**POWER UP!**  
APRIL 11-14  
HOTEL ZAZA, AUSTIN TX

TC TechCrunch   NBC   HOUSTON CHRONICLE   Forbes   Chicago Tribune   Bloomberg Businessweek   Austin American-Statesman   abc   THE TEXAS TRIBUNE

Video games have created spaces for autonomy, authenticity and self expression, but how do we have that same kind of freedom in the real world? At ETS22 Power Up we will bring together



# Governance

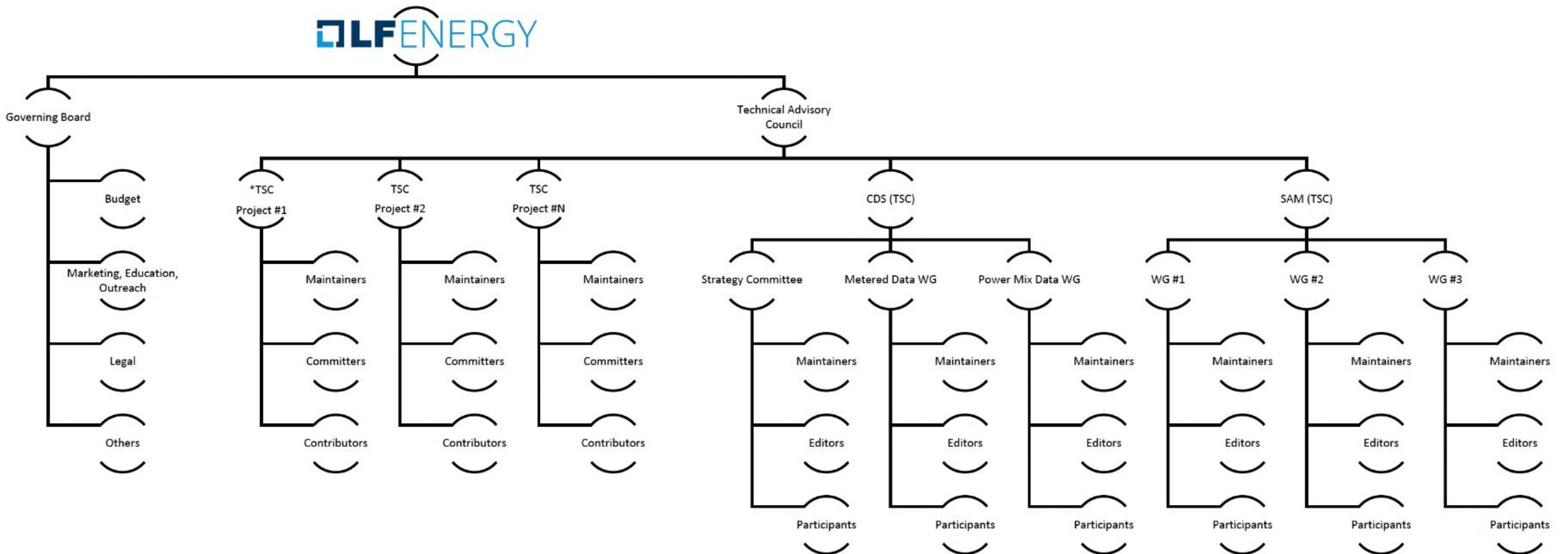
# At the heart of LF Energy is Governance



# LF Energy Governance in Roles

- A Technical Steering Committee (TSC) oversees each project. Each TSC has an elected Chair who both leads a project TSC and represents the concerns of a project to the Technical Advisory Committee (TAC). Participation on the TSC is based on merit, expertise, and contribution to the code or artifacts (e.g. testing, documentation) of the community.
  - Strategic Members can appoint 1 representative to a TSC for an initial 6-month basis to jump start engagement
  - Membership on a TSC thereafter is based on technical contribution—e.g., contributing a new project
- A Technical Advisory Committee (TAC) addresses technical community concerns such as: new projects, release planning, cross-project collaboration, and documentation practices. The TAC is composed of the Chairs for each project TSC, plus a Governing Board representative to ensure alignment between technical and business concerns. There is an elected TAC Chair who represents the technical community on the Governing Board.
  - Strategic Members can appoint one voting representative to the TAC
  - Each project from Early Adoption has one vote on the TAC
- The Governing Board (GB) is limited to Strategic members and the elected TAC Chair. The GB determines allocation of funding to priorities and provides members with control over where their funding goes.
  - Strategic Members each appoint 1 representative
  - General Members can elect 1 representative for every 10 General Members, up to 3 total
  - Governing Board establishes additional committees to address topics (e.g. legal, marketing, budget)

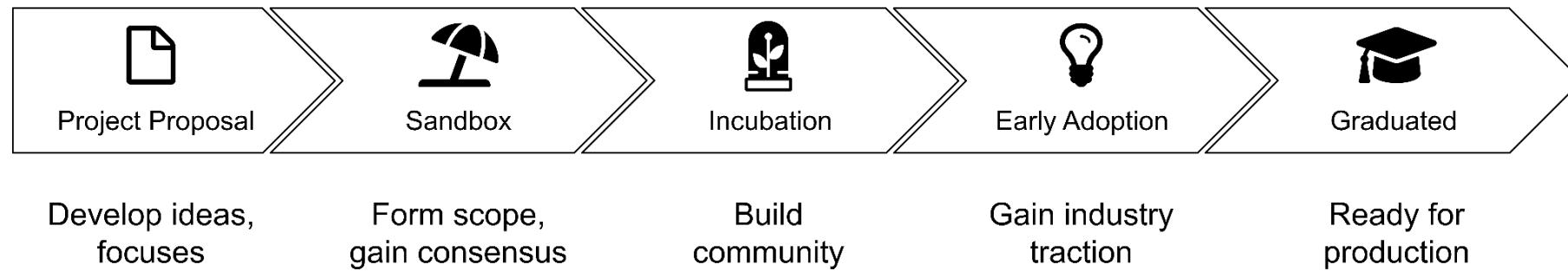
# Governance model



\*Technical Steering Committee (TSC)

# LF Energy project lifecycle

- Projects can become part of LF Energy through the submission of a mature code base.
- Projects can also be formed through special interests groups that submit a proposal and then form as an incubation project.
- Learn more at <https://www.lfenergy.org/host-your-project/>



# Transparency

All project governance documentation can be found at:

<https://wiki.lfenergy.org/display/HOME/LF+Energy>

The screenshot shows the LF Energy Foundation website's dashboard. On the left, there is a sidebar with links to the LF Energy blog, team files, space shortcuts, and a page tree. The main content area features a brief introduction about LF Energy, mentioning its focus on building shared open source infrastructure for renewable energy, power electronics, and electric mobility. It also highlights the LF Energy Guiding Principles and the Technical Advisory Council and Governing Board. Below this, a section titled "Current Projects" lists various projects under "Early Adoption" and "Incubation". Each project is represented by a logo and a name: GXF, OPERATOR FABRIC, POWSYBL, SOGNO, CoMPAS, EVEREST, FLEDGE POWER, GRID CAPACITY MAP, Hyphae, OPENEEMETER, OpenGEH, and openLEADR. At the bottom of the page, there are links for "Space tools" and "Create". The right side of the page includes a sidebar with contact information and links to resources like the presentation template.

# Membership Model

# Membership and Participation Levels

Membership Level	Annual Fee	Plus Linux Foundation Membership: Silver (if not a member)	Board Seat	TSC Seat	Outreach Committee	Suggested Minimum FTE*	Notes
Strategic	Flat fee: \$150k	\$20k	Yes	Yes	Yes	1	Two year minimum commitment
General	\$5k-50k based on org size <sup>1</sup>	Based on number of employees \$20K (5000+) \$15K (499-4999) \$10K (100-499) \$5,000 (0-99)	(Possible) 1 per every 10 General members	Based on Merit	Yes	N/A	A TSC seat may be earned by technical contribution as a project leader
Associate	No fee	No	(Provisional at start-up)	Based on Merit	Yes	N/A	Limited to academic, research and NGO organizations

## General Annual Fee Scale

\$50K - > 5,000 employees  
 \$30K - 1,000 – 4,999 employees  
 \$20K - 200 – 1,000 employees  
 \$10K -100 – 200 employees  
 \$5K -< 100 employees

\* FTE = Full Time Equivalent (e.g. 2 employees each spend 50% of their time on a project). This suggestion is meant to provide a minimum resource investment to ensure members are contributing technically. Most projects see much higher investment of resources than the minimum requirement.

# LF Energy Membership Benefits

Tier	New to LF	Existing LF member	Benefits
<b>Strategic</b>	\$170,000	\$150,000	<ul style="list-style-type: none"> <li>• Appoint one (1) voting representative to the LF Energy Governing Board.</li> <li>• Appoint one (1) voting representative to the LF Energy Technical Advisory Council (TAC)</li> <li>• Appoint one (1) representative as a voting member in any subcommittees or activities of the Governing Board.</li> <li>• Enjoy most prominent placement in displays of membership including on the website and in marketing materials.</li> <li>• 1 guest LF Energy blog post per quarter</li> <li>• 1 LF Energy hosted webinar per quarter</li> <li>• 1 Linux.com blog post per year</li> <li>• 10 complementary LF Training course/certification tickets</li> <li>• Create an individualized press release to announce membership with LF Energy PR.</li> <li>• Receive greater insight into LF Energy strategy and project roadmaps through increased engagement with the LF Energy Executive Director and staff.</li> <li>• Receive ongoing, monthly 1:1, individual engagement and guidance from LF Energy Executive Director</li> <li>• Increased access to invitation-only Linux Foundation Member Summit.</li> <li>• Receive discounts on LF Energy conferences + event sponsorship.</li> </ul>
<b>General</b>	<p>\$70,000 (USD) 5,000+</p> <p>\$40,000 (USD) 2,000 – 4,999</p> <p>\$25,000 (USD) 500 – 1,999</p> <p>\$15,000 (USD) 100 – 499</p> <p>\$10,000 (USD) Up to 99</p>	<p>\$50,000 (USD) 5,000+</p> <p>\$25,000 (USD) 2,000 – 4,999</p> <p>\$10,000 (USD) 500 – 1,999</p> <p>\$5,000 (USD) 100 – 499</p> <p>\$5,000 (USD) Up to 99</p>	<ul style="list-style-type: none"> <li>• (Possible) Governing Board seat 1 per every 10 General and Academic and Research Institutions members collectively as a class, with a maximum of 3.</li> <li>• 1 guest LF Energy blog post per year</li> <li>• 1 LF Energy hosted webinar per year</li> <li>• 10 complementary LF Training course/certification tickets</li> <li>• Participate in all marketing, community, thought leadership opportunities.</li> <li>• Receive discounts on LF Energy conferences + event sponsorship.</li> <li>• Identify your organization as a member and display your logo on the LF Energy website and in marketing materials.</li> <li>• Access to The Linux Foundation's invitation-only Linux Foundation Member Summit.</li> </ul>
<b>Non-Profit</b>	\$1,000	\$1,000	<ul style="list-style-type: none"> <li>• The Non-Profit category of membership is limited to non-profit/non-governmental organizations. This requires approval by the Governing Board.</li> <li>• Participate in all marketing, community, thought leadership opportunities.</li> <li>• Receive discounts on LF Energy event sponsorship.</li> <li>• Identify your organization as a member and display your logo on the LF Energy website and in marketing materials.</li> </ul>

# For Further Information

## **Shuli Goodman**

Executive Director

Linux Foundation Energy

[sgoodman@lfenergy.org](mailto:sgoodman@lfenergy.org)

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Our Website: <https://lfenergy.org>

Membership: <https://www.lfenergy.org/join>

Mailing Lists: <https://lists.lfenergy.org>

Our Wiki: <https://wiki.lfenergy.org>

