



CitrineOS

Open Source Charger Network Software for Rapid OCPP 2.0.1
and NEVI Compliant EV Charge Management

November 28, 2023



Empowering the Global EV Revolution with Open Source Innovation

At CitrineOS, our mission is to drive the transformation of the electric vehicle (EV) charging landscape, making it more attainable, equitable, and diverse than ever before. For over a decade, our parent company, S44, has been at the forefront of EV charging software, powering automotive OEMs and leading EV network operators. Now, through CitrineOS, we are taking a giant leap forward in advancing the adoption of electric vehicles and diversifying the EV charging infrastructure worldwide.

CitrineOS Founding Team



Thana Paris
Director Open-Source
Program Office



Julian Offermann
CEO



Olga Haygood
Chief Growth Officer



Manuel Belšak
Senior Cloud Engineer



**Christian
Weissmann**
Senior Software
Engineer

Empowering Mass EV Adoption with CitrineOS

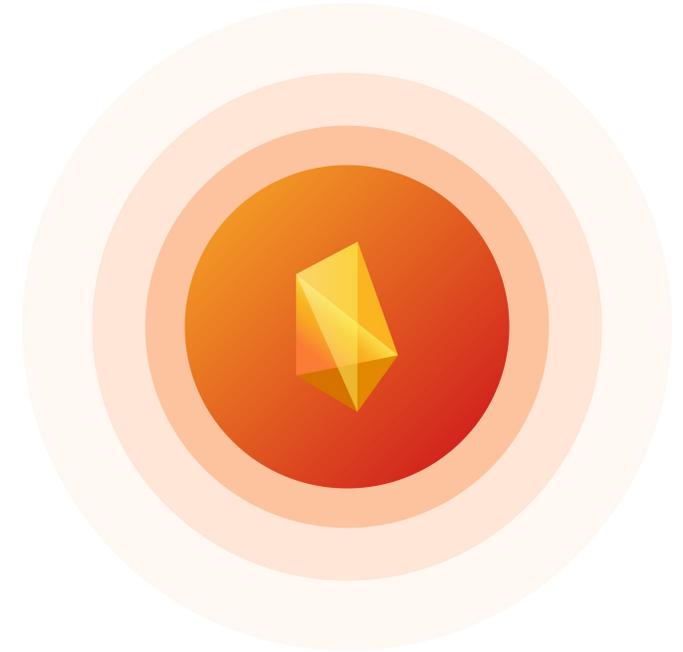
Future-Focused: Supporting the transition to OCPP 2.0.1 and beyond.

Seamless Integration: CitrineOS easily integrates as a backend component into existing ecosystems.

Modularity Emphasized: Designed with a modular approach for flexibility and scalability.

Open Technology Stack: Filling the open-source gap for OCPP 2.0.1 CSMS, ISO15118 implementation (MaEVe), and modular design.

Consumer-Centric: Our mission is to create an exceptional consumer experience, exceeding expectations to drive mass EV adoption.



CitrineOS Capabilities

CitrineOS is a catalyst for change in next generation, reliable open source back-end software to manage and build EV charging networks with an open-source foundation.

How does it impact?

In a landscape of closed networks and outdated protocols hindering EV adoption, CitrineOS is built using the industry's first open-source foundation for creating a scalable, modular CPO network.



Provision New Charging Equipment



Complete Charging Transactions



Remotely Control Charging Equipment



Monitor Uptimes, Power Levels and Degradation



Manage Energy Consumption and Throughput



Open Charge Point Protocol (OCPP 2.0.1)

CitrineOS Innovation

Rapid Deployment

90% faster time-to-market compared to other custom solutions.
100% API based for fast integration

Modular

Message buses communicate with a central system via a pub/sub system. 3rd party modules will be supported.

Cloud Agnostic

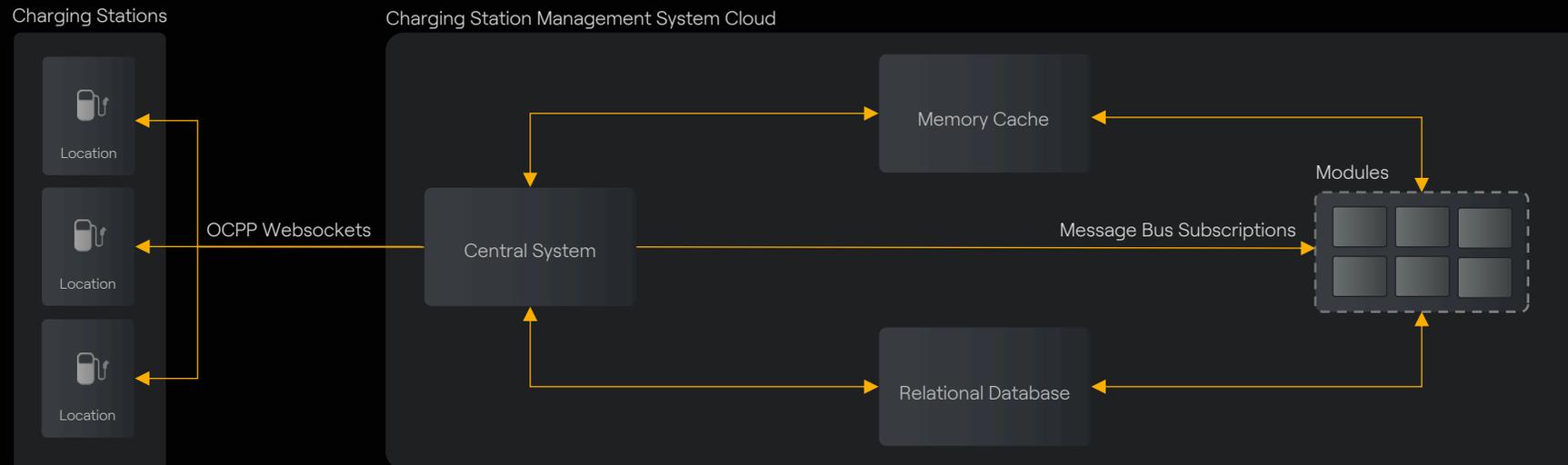
Runs and scales on any cloud provider. Serverless runtime with low management footprint

Operator UI

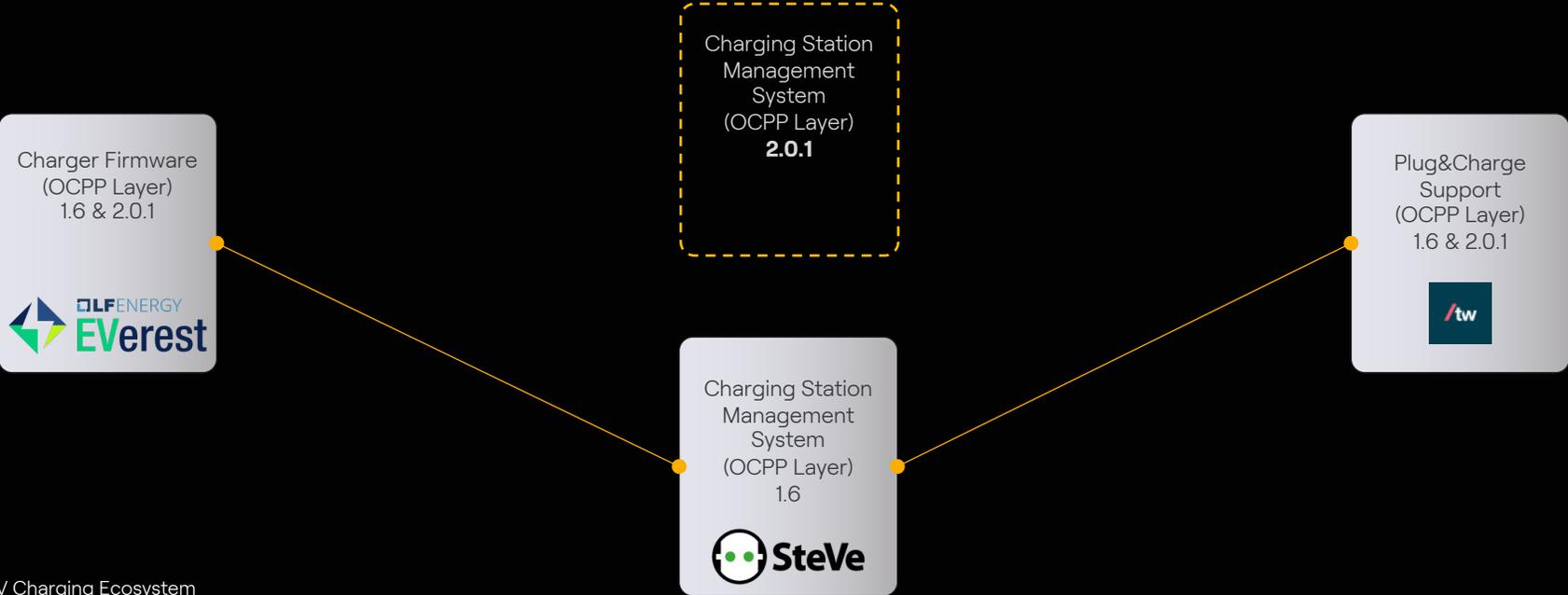
Directus-based user interface for charging network operators to view and manipulate data.

System Architecture

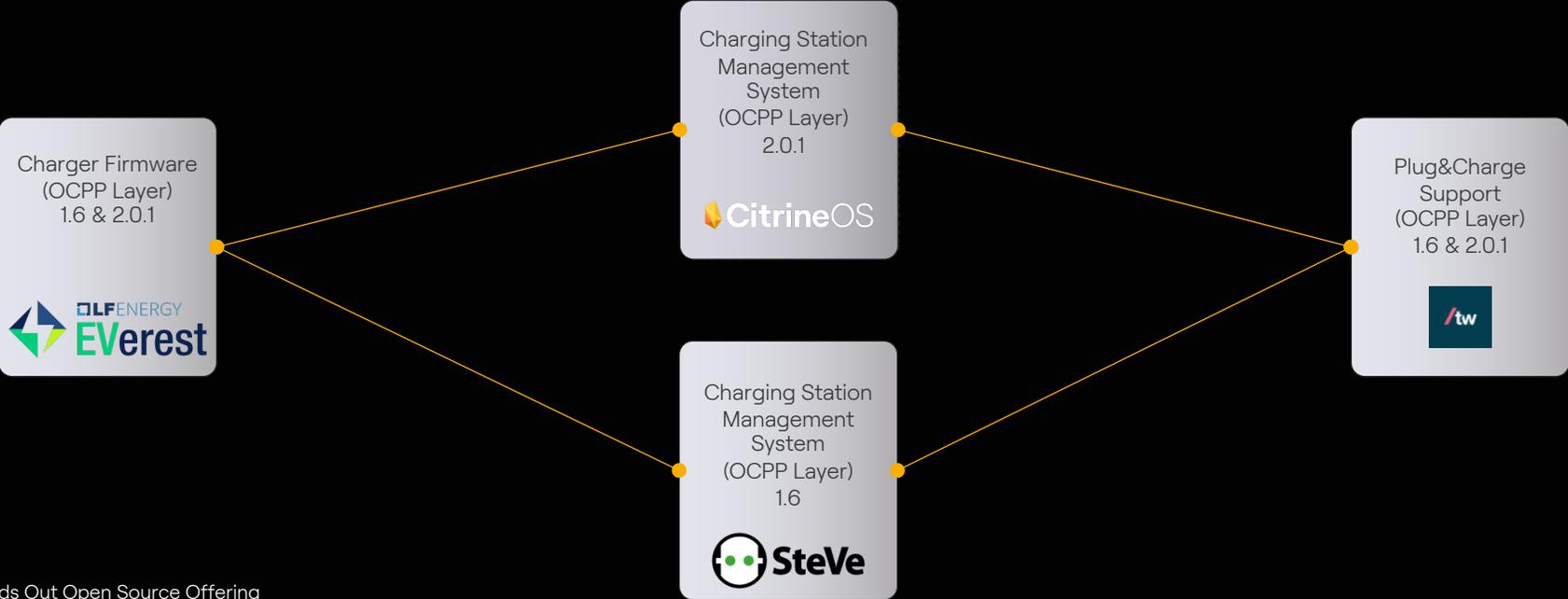
Citrine is an OCPP 2.0.1 Charging Station Management System (CSMS) designed to be adaptable to various infrastructures and easily extensible via modular design. It uses the fastify web framework.



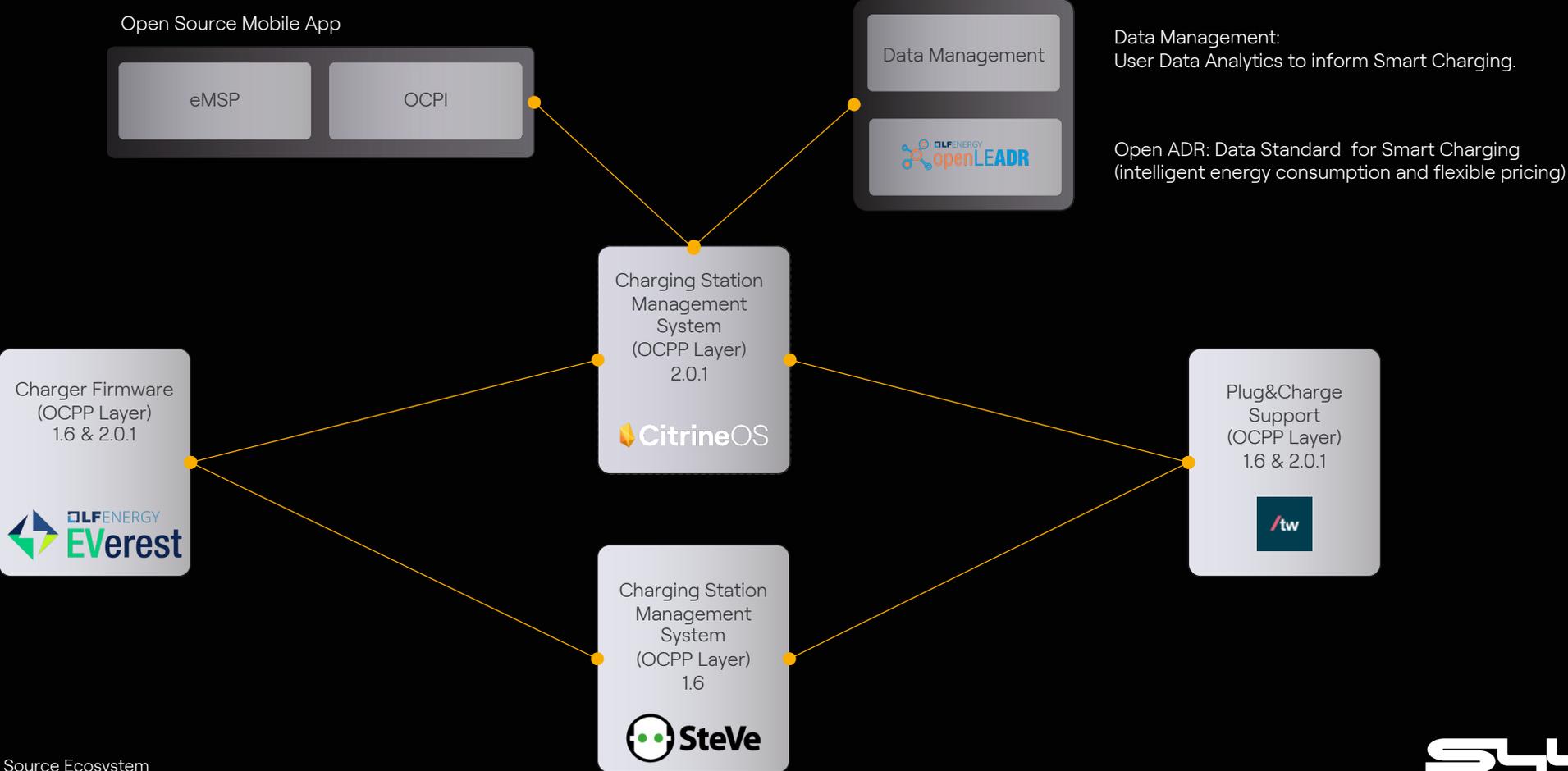
Open Source EV Charging Ecosystem



Open Source EV Charging Ecosystem



CitrineOS Vision for Future Open Source EV Charging Ecosystem





Current State & Road Ahead

Elevating Community Connection: From October to Present

GitHub

- Clones: 44
- Stars: 18
- Forks: 3

Discord

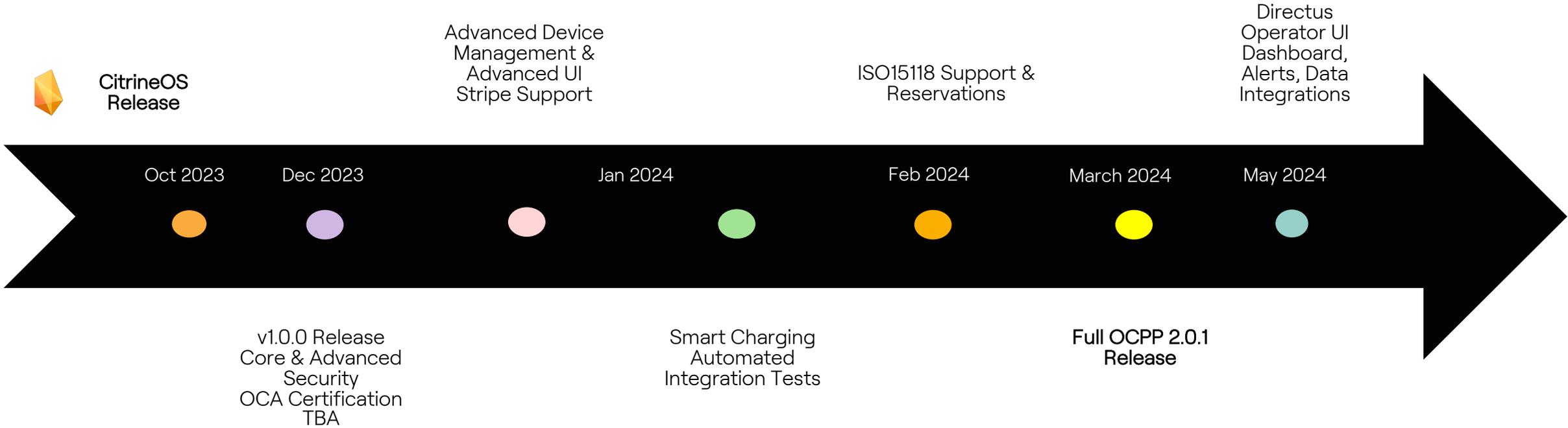
- 36 active members on Discord

Open-Source Community

- Ongoing discussions and collaboration with EVERest, MaEVe, and Stackbox



CitrineOS Roadmap



Approach & Best Practices

Contributor Code of Conduct

Trust, respect, collaboration and transparency are core values we believe should live and breathe within our projects.

See our rules: github.com/citrineos/citrineos

Investment

S44 will be dedicating resources towards CitrineOS for the foreseeable future. Our industry experiences will feed into its design and expansion.

Communal Growth

Transparency

One for All



Appendix: CitrineOS LF Energy Application

Is this a new project or an existing one?

CitrineOS is a new product.

Current lead(s)

N/A

Sponsoring organization(s), along with any other key contributing individuals and/or organizations

S44

Detail any existing community infrastructure, including:

- Connect with us on Discord: <https://discord.gg/kkUxF7pRU7>
- Visit our website: <https://www.s44.team/citrineos>
- Check out our Github account: <https://github.com/citrineos>

Are there any specific infrastructure needs or requests outside of what is provided normally by LF Energy? If so please detail them.

Outside of access to mailing lists, CitrineOS will not require additional support.

Why would this be a good candidate for inclusion in LF Energy?

CitrineOS is an ideal candidate for LF Energy because our mission of transforming EV charging aligns with LF Energy's goals of rapid decarbonization and sustainability.

Leveraging a decade of EV charging software experience from our parent company, S44, we work towards equitable EV adoption, aligning with LF Energy's carbon reduction and clean energy objectives. Through innovation and open-source initiatives, we contribute to a cleaner and more prosperous energy ecosystem, reinforcing our commitment to sustainability and alignment with LF Energy's mission.

How would this benefit from inclusion in LF Energy?

CitrineOS will benefit from inclusion in LF Energy through:

- Inclusion in LF Energy open source infrastructure
- Reputation alignment
- Partner identification (e.g. EVerest)
- Community building for collaboration
- Product lifecycle management

Provide a statement on alignment with the mission in the LF Energy charter.

At CitrineOS, we are committed to aligning with the mission outlined in the LF Energy charter. Our mission to drive the transformation of the electric vehicle (EV) charging landscape directly contributes to the goals of LF Energy. LF Energy is dedicated to creating a technology ecosystem that facilitates rapid decarbonization and promotes environmental sustainability, economic prosperity, and social well-being for future generations.

By leveraging over a decade of experience in EV charging software through our parent company, S44, we are actively working towards making EV charging more attainable, equitable, and diverse. Our efforts to advance the adoption of electric vehicles and diversify the EV charging infrastructure worldwide directly align with LF Energy's objectives of reducing carbon emissions, promoting cleaner energy solutions, and fostering a more sustainable future.

Through innovation, collaboration, and open-source initiatives, we are not only contributing to the transformation of the EV industry but also supporting the broader mission of LF Energy to create a cleaner, more prosperous, and socially responsible energy ecosystem for the benefit of all. Our commitment to aligning with LF Energy's mission underscores our dedication to a sustainable and equitable future for generations to come.

What specific need does this project address?

In our quest for a greener future, we face a pivotal challenge: by 2030, 50% of new U.S. cars will be EVs, but today 28% of chargers in leading cities don't work. Developers must build innovative software to improve and grow the charging network so EV owners can travel with confidence. CitrineOS provides the open source software to fuel this change. The project is NEVI compliant, globally available and open to all. CitrineOS offers a community-tested and reliable open source software for charger management which drives forward adoption of the OCPP 2.0.1 protocol resulting in more reliable charging networks worldwide.

Describe how this project impacts the energy industry.

When implemented it will broaden access to and utilization of EV charging networks while making it more secure, intelligent and manageable.

Describe how this project intersects with other LF Energy projects/working groups/special interest groups.

CitrineOS intersects with EVERest essentially by forming a holistic ecosystem for EV charging by covering both, the charger firmware and charger management software.

Further, CitrineOS intersects with openLEADR to further integrate OpenADR into the charger management software to provide an intelligent and systematic approach for demand response.

Who are the potential benefactors of this project?

CitrineOS will benefit a number of groups:

- Prospective Charge Point Operators (CPOs) seeking solutions to kick-start their EV charging projects.
- Developers looking to work in electrification and EV charging.
- The general public that is looking to leverage reliable and functioning charging stations.

What other organizations in the world should be interested in this project?

Additional organizations that would be interested in and benefit from CitrineOS include:

- Global energy companies
- Local utility providers
- Fleet operators

Plan for growing in maturity if accepted within LF Energy

- Engagement and code contribution by developer community
- Market adoption
- Expansion from OCPP central system to OCPI compliance, OpenADR, mobile app interfaces, and other
- Hardware compatibility (e.g., various manufacturers)

Project license

Apache 2.0

Is the project's code available now? If so provide a link to the code location.

CitrineOS will be publicly available on October 18, 2023.

Does this project have ongoing public (or private) technical meetings?

N/A

Does this project's community venues have a code of conduct? If so, please provide a link to it?

Community has not been opened yet and therefore the Code of Conduct has not been shared. However, once it is public, CitrineOS will provide a code of conduct to align all contributors.

Describe the project's leadership team and decision-making process.

CitrineOS strives to assemble an impactful leadership in addition to the designated Director of Open Source Project, Thana Paris. The decision-making process in the future will be determined by the community.

Does this project have public governance (more than just one organization)?

CitrineOS does not have public governance.

Does this project have a development schedule and/or release schedule?

As part of planned community launch of CitrineOS, a development schedule will be assembled in collaboration with the developer community.

Does this project have dependencies on other open source projects? Which ones?

CitrineOS depends on various npm packages that are provided by other communities in order to facilitate data storage through ORM, message brokering amongst others.

Describe the project's documentation.

Upon community launch, CitrineOS will have the following:

- README describing project's intent and usage
- Developer documentation with build and run instructions
- API documentation for usage of system

Describe any trademarks associated with the project.

No trademarks associated with CitrineOS at present.

Do you have a project roadmap? If so please attach or provide a link.

Our immediate goal is to expand the project's OCPP 2.0.1 compliance.
Project roadmap is published on Github.

Are this project's roadmap and meeting minutes public posted?

No.

Does this project have a legal entity and/or registered trademarks?

Not at present.

Has this project been announced or promoted in any press?

Press promotion and outreach is embargoed, and will be published on October 18, 2023.

Does this project compete with other open source projects or commercial products?

To our knowledge, CitrineOS does not compete with any other open source projects. The following commercial products would be considered a competitor:

- Driivz
- Ampeco
- ChargeLab
- Shell Recharge Solutions
- EV Connect
- ChargePoint

Additionally, there are other open source projects related to OCPP (thank you to [@shankari](#) for pointing out that we should clarify this):

EVERest

EVERest is the charger-firmware side of OCPP instead of a CSMS like CitrineOS. We will be making sure CitrineOS is compatible with EVERest!

MaEVe

MaEVe was originally focused on ISO-15118-2 functionality only and has seen sporadic updates since pertaining to more general function as a CSMS using both OCPP 1.6 and 2.0.1. CitrineOS will distinguish itself with more active contributions and a clearer mission statement: CitrineOS aims to be a fully functional OCPP 2.0.1 CSMS.

SteVe

SteVe is a OCPP 1.6 CSMS. The difference between OCPP 1.6 and 2.0.1 is substantial, although they share things conceptually 2.0.1 is a full rewrite of 1.6 with many additional features. As such, we don't expect there to be much overlap between CitrineOS and SteVe for now. We encourage those looking for an OCPP 1.6 CSMS to use SteVe!



Thanks for your consideration!

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