

How New Open Source Mail Servers and Clients Make Self-Hosting Practical Again

Taking Email Back

The fourth in a five-part series on European-funded open source projects in hardware and software. *By Jeffrey A. McGuire*

Three Homes, No Data Center

Deuxfleurs, a French nonprofit, keeps its servers in members' homes in Lille, Nantes, and Massy: two or three second-hand Lenovo ThinkCentre mini PCs each, with a copy of the same data so its websites stay up when one of them loses power or fiber line. Quentin Dufour, one of the founders, says some major French websites already serve their pages from this setup. Next, the collective wants its email to work the same way.

The software for self-hosting email in this manner is called Aerogramme, and it isn't finished. Deuxfleurs still runs its own mail on Dovecot, a long-established open source mail server, and plans to move to Aerogramme around January 2027.

The collective is heading the opposite way from almost everyone else. According to the independent daily DNS measurements published by RIPE Labs, email for the million busiest domains on the web has consolidated dramatically: In 2016, 44.6 percent of these domains used small or self-hosted servers, and that share halved to 22.4 percent by July 2026. Small regional hosting companies and independents are losing accounts to corporate providers like Google and Microsoft, who together handled 38.6 percent of these busy domains.

Email is older than the Internet itself, and it still runs on open standards anyone can implement. Any server can deliver to any other, and any standards-compliant client can read any mailbox. It's the hosting that has concentrated into a very few hands, eroding autonomy and giving hosting providers power over the data that travels through digital correspondence.

Two cases illustrate how this can limit operational independence. In May 2025, staff at the International Criminal Court (ICC) told the Associated Press that the court's chief prosecutor lost access to his Microsoft email account after he was named in US sanctions; Microsoft denies suspending services but hasn't explained what happened to his account. In February 2026, the Dutch government told its parliament that the tax administration was moving about 40,000 workplaces to Microsoft 365 for lack of a short-term alternative, while acknowledging that Microsoft could be forced under state pressure to stop delivering services.

The Dutch government reversed course in October: The tax administration, customs, and the benefits agency will run mail and calendar on their own servers from 2027, with European open source tools for storage and collaboration to follow. The question now: How are developers working to decentralize email hosting on a wider scale? Each obstacle pushing organizations off of small or self-hosted email servers has open source projects working on a solution. Three of them show how the pieces fit; all of them supported by NGI Zero, the EU-funded programs that enable open source research and development.

How Email Got Away from Us

In the 1990s, running your own mail server was ordinary. Universities and small companies did it, and so did Mauro De Gennaro. In 1993, as a teenager, he fetched mail for users of his bulletin board over UUCP: the dial-up protocol Unix machines used to exchange mail. He has worked on mail software for most of the three decades since. When he looked at the open source stack again about six

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years ago, he saw "it's the same software that companies and servers have been using for over 20 years."

He counts 12 separate programs to run a conventional self-hosted setup. Each has its own configuration format and logs, written by different people in different styles. The software works well, he says, but was "designed and documented for other developers." Bundles such as Mailcow and Mail-in-a-Box install the whole set at once: "They abstract the complexity," De Gennaro says, "but they do not remove it." Since all of it was designed for a single machine, running it as a cluster server is possible in the same way it's possible to take a Fiat Cinquecento and turn it electric: "It was not designed for that." Google launched Gmail into that friction in 2004, with a gigabyte of free storage, and let companies run their own domain's mail on it. "Then they started billing," De Gennaro says. The users were captive, and moving email is disruptive enough that few of them left.

Ben Bucksch joined the Mozilla mail team in the late 1990s, where his first contribution made email links clickable; he also served in leadership for the Thunderbird Council and invented AutoConfig, which lets a mail client set up an account from nothing but an email address. In his telling, the lock-in started within the client.

IT departments think about email as servers; "what users want is to keep their workflow," Bucksch says. Microsoft shaped those workflows with Outlook's calendar and corporate features: Outlook works properly only with Microsoft Exchange, and Microsoft is pushing Exchange customers into its cloud. By some estimates, about 75 percent of professional mailboxes are on Office 365. "If we want to free the lock-in," he says, "we need to start with the client."

Dufour and Armaël Guéneau of Deuxfleurs locate the problem in operations. IMAP is the protocol most clients use to read mail. An IMAP server has to serve webmail that queries the server for every view, desktop clients such as Thunderbird that synchronize whole mailboxes, and phones that do some of each. Implementing it is hard; the reliability people expect is harder. When the tax office sends you an email, Dufour says, "it must work." The expertise to run mail at that level, Guéneau says, "tends to be captured by hyperscalers."

As Dufour tells it, Google didn't adapt existing mail software; it built Gmail on top of its distributed storage. Open source mail software was designed for one machine first, so adding distribution later, he says, requires "really huge trade-offs."

Reclaiming email is more complex than deciding to run your own server and navigating the software. Your service has to fluently speak with the large providers and support migration without disrupting service. And, of course, it needs sustainable funding.

Today, publicly funded teams are working on solving each of those three problems.

Rebuilding Server, Client, and Storage

Stalwart, the server from De Gennaro's team, focuses on streamlining the software to replace 12 programs with one: Installation takes two commands and a six-screen web wizard. It speaks every common mail and collaboration protocol: SMTP for sending, IMAP and POP3 for reading, JMAP for web-based mail, and CalDAV and CardDAV for calendars and contacts. Spam filtering, sender authentication, and TLS encryption are built in. Give it a token for a DNS provider such as Cloudflare or Route 53, and the server publishes its own mail records. Behind the wizard are nearly 3,000 settings across 176 screens, which most operators never touch. De Gennaro calls Stalwart "the software at the other end of your email client or calendar client."

Stalwart 1.0 was released in October 2026 after five and a half years of development. NGI Zero funded the project with two grants: one for the mail server, and one for calendars, contacts, and file storage.

For users who can't leave Outlook features behind, there's Parula. Keeping the application logic strictly separate from a thin interface layer, and a well thought-out common logic, so a new protocol takes "just a few thousand lines of code," Bucksch and his team at Beonex GmbH built an Outlook-like interface alongside a modern interface, a chat-style view and a classic three-pane view. It runs on a JMAP server or any other mail server and offers shared team mailboxes, delegated access so an assistant can run a manager's calendar, and free/busy lookups for team meetings. It speaks IMAP, JMAP, and POP3, plus four from Microsoft: Exchange Web Services (EWS), Exchange ActiveSync, Microsoft Graph, and Outlook Web Access.

Partially funded by NGI Zero, Parula also removes a dependence most people never notice. Multi-factor login typically runs through Google's or Microsoft's identity services; an AutoConfig extension allows a client to discover and log in directly to an organization's own identity server. Bucksch says that Parula is the first desktop client that does this.

Aerogramme, an IMAP server that doesn't keep any state of its own, answers the operations problem in the storage. It doesn't send or receive mail, so it needs a separate mail transfer agent such as Postfix; then it encrypts each mailbox on Garage, compatible with Amazon's S3 interface. Garage replicates every piece of data in three locations, so users can still read and write their mail if a site goes offline. This design for power cuts and residential Internet connections gave up perfect synchronization, but it spreads maintenance work among five to ten members rather than requiring one big server host to give up all his weekends.

The research problem, Dufour says, is mapping the mail, calendar, and contact protocols cleanly onto object storage. Aerogramme is still on the way, with internal deployment planned for January 2027 and a public beta a few months later. To get there, a second grant funded through NGI Zero is supporting a hunt for edge cases where a network delay or a failure halfway through writing could lose a message.

The three projects already interoperate with each other and with other email programs on the NLnet list funded by NGI Zero. Parula lists Stalwart as a supported server; Stalwart can keep its messages in Garage. Bucksch and De Gennaro both name Mox as another server built as a single package. Different teams, working separately, have split the email problem and built solutions that fit back together.

How to leave Gmail and Office 365 at Any Scale

Three kinds of users want out of the large providers: organizations on Office

365 or Google Workspace, people with a Gmail address, and individuals who want to run their own server. Whatever the size, open source offers these users a path forward.

For a large organization, migration is where projects stall. Stalwart's import tool, Vandelay, moves mailboxes from Exchange or a Google Takeout archive into any JMAP server. A migration proxy sits in front of the old and new servers and routes each user to the one that hosts their mailbox; accounts can move one at a time without downtime. While there are plans to add native Exchange protocols to a release before the end of 2026, so users can keep Outlook as a mail client, migrating accounts one at a time is slow. But possible: the largest deployment de Gennaro can name is Thundermail, Thunderbird's email service built on Stalwart, which has about 100,000 accounts. Others include German universities and the state of Rhineland-Palatinate, with about 50,000 users.

Parula approaches the same problem from the desktop, to "decouple the difficult end user part, which is mostly social, from the difficult migration part, which is mostly nuts and bolts," Bucksch says. Because Parula speaks Exchange's protocols, a small workgroup can try it against the company's existing Office 365 without risk. Once everyone uses Parula, the underlying server no longer matters, and IT can move at its own pace. Migrations of 10,000 people are underway, and several large projects with 30,000 users have begun self-hosting.

A person leaving Gmail is "the easy case," Bucksch says. "You just need to decide to do it." You can use any number of mail providers, like the free GMX, or the professional German provider *mailbox.org*. In fact, it works with any provider that does not put up a specific roadblock.

For the individual self-hoster, the answer is narrower. "My mom can't do it," Bucksch says. De Gennaro's recipe is short: a virtual server from a European host such as Hetzner or OVH, Stalwart, "and that's it."

Dufour adds a fourth user. Big tech operates at the scale of the planet, and self-hosting at the scale of one person. Email belongs between them with communities of interest: a federation of nonprofits, a group of companies, everyone working in a country's cultural sector. "If you have five engineers that manage 10,000 people, we think it could be possible to operate Aerogramme correctly," he says. Aerogramme is part of the solution at that medium scale, built to show that other collectives can copy the Deuxfleurs model and that a small team can provide a service that works, which is what most users care about.

Get Self-Hosted Mail into the Inbox

Configuration is no longer the obstacle. Ask why people don't self-host mail, and the first answer is usually the spam folder. To get through major providers' filters, senders of more than 5,000 messages a day must authenticate with SPF, which lists the servers allowed to send for a domain; DKIM, which signs each message with the domain's key; and DMARC, which tells receivers what to do when those checks fail. But all three necessary DNS records can be published by any domain owner. And new servers do it automatically.

What remains is the server's IP reputation. Even with all three records, "Google and Microsoft will place every single email you send in the spam folder," De Gennaro says, if the server's address sits in a range with a bad history. Some popular hosting providers are on those lists before a customer sends anything. De Gennaro prefers a clean address because "you don't want people to be in the middle of the emails you send"; he found his own by trial and error, moving from DigitalOcean to a Hetzner machine in Finland. The alternative is to relay outgoing mail through a delivery service such as SMTP2GO or Amazon SES, at the cost of a third party in the path.

There are two other ways around the problem. The first is how Deuxfleurs sends mail. The collective limits its send rate and buys connectivity from alternative ISPs whose addresses aren't listed as residential and whose reverse DNS it can configure. One member specializes in email and runs a shared outbound gateway; other hosters route mail for Gmail, Microsoft, and other hard destinations through it. Dufour likes that it's "not a technical approach but a human one." The second is a proposal DeGennaro says he hadn't put forward before. It directly resolves the issue of large providers filtering out self-hosted email without consequence: Self-hosters should organize and ask EU regulators to fine providers that discriminate.

JMAP, IMAP, or Exchange: Choosing a Protocol

The three projects don't agree on which mail protocol to build for. Each one reaches different devices and users, so an organization picks the one that fits.

Stalwart and Parula both agree that JMAP is the best protocol, which the Internet Engineering Task Force (IETF) standardized in 2019. Operators open one port for mail clients instead of two to four, and developers work with JSON over HTTP. De Gennaro describes IMAP as a book that has collected hundreds of extensions in its margins, until someone decided to write the whole book again on a clean page as JMAP. But end users, he says, won't notice a difference.

Deuxfleurs builds on IMAP anyway, for the devices people already own. Dufour uses an iPhone 8, and Guéneau carried an iPhone 7 until recently; Apple no longer updates either phone, and both read mail over IMAP. Deuxfleurs keeps Aerogramme's distributed core separate from the protocol, so the team could add JMAP later.

The third protocol suite is Microsoft's. Parula can choose from four different Exchange protocols. With one email address and one password, a user can connect mail, calendar, and contacts on almost any phone. Microsoft controls access to ActiveSync through patents on the protocol, which it is willing to enforce in court, and by limiting how even its own clients can interact with it. On October 1, 2026, Microsoft began blocking requests from Exchange Web Services to Exchange Online by default. It plans to shut EWS down completely in April 2027, so open source email clients relying on it will be cut off from Exchange Online mailboxes unless they move.

In Bucksch's account, Microsoft and Google already make it hard for independent clients to log in; Parula gets in through a protocol they figured out while building Owl, Beonex's Thunderbird add-on for Office 365. Guéneau's

preferred lever is policy, in the form of EU rules requiring devices to support all standardized protocols, on the model of the repairability score that France made mandatory in 2021.

How the Projects Pay Their Way

None of the three projects earns money from its users' email. Deuxfleurs runs on public grants. Alongside their open source code, Stalwart Labs sells an Enterprise Edition and Beonex sells proprietary models.

Aerogramme's developers name their own limits: a storage design not yet proven in production, too few contributors for support and governance, and a deliberately narrow feature set. The smaller scope self-selects for small self-hosters.

Stalwart Labs licenses the Community Edition under the AGPL, with DeGennaro estimating roughly 15 percent of its users are paid. That funding covers features self-hosters don't need, such as multi-tenancy and SCIM, a standard for creating user accounts from a company directory. "Open source unfortunately is not a business model," De Gennaro says, by which he means a predictable income: Donations wouldn't cover rent anywhere in Germany. The grants covered development and then ended. The guarantee that the open edition won't fall behind, he says, "is basically trust." In five years, he hasn't moved any feature from open to enterprise, and he has moved some the other way.

Beonex licenses Parula's core under the open source European Union Public License (EUPL). Its Exchange support, webmail, and video meeting modules are proprietary, and a compile-time flag produces a fully open source build without them. "I have to pay rent and our employees" Bucksch says. His red line is the company that pays Microsoft up to EUR40 per user per month and expects Parula for free; private users on open protocols don't pay anything.

Asked what public funding paid for, each builder names work that customers and investors wouldn't. For Guéneau, it was a year spent on correctness "on my own terms." Dufour, who has consulted for startups, says they can't ask for a year of research and development before testing the product against the market. Bucksch says he deliberately hasn't taken any venture capital so Beonex can "stay in charge of the important choices." De Gennaro says the Stalwart build might have happened faster with venture capital, but "none of that would have been open source."

The European Commission's open source strategy, adopted in June 2026, names secure email among the alternatives it will support with member states. Its goal is at least 30 million active users of open source collaboration and productivity tools, instant messaging, and secure email by 2030. All those users would see improvements in data protection and in their ability to switch services when something stops working.

Email Is Like the Bicycle: Great Old Tech That We're Still Improving

Dufour's picture of email's future is a bicycle. A regular bike has hardly changed in shape: it's two wheels and a frame, even if each piece is constantly being optimized. Companies keep trying to reinvent it with a third wheel or something fancier, and people keep choosing the basic design because it meets their needs. Email, in his view, is the same kind of technology: a design that works and needs steady refinement. "With IMAP, there are a lot of things we can do," Dufour says. "We could spend our whole life just improving it."

Asked who will run email in 10 years, each builder gives a different answer. Together, they show the choice every email user faces. De Gennaro expects most companies with an IT department to host their own. Bucksch additionally expects a hosting market: servers that update themselves, and many providers that already sell a website for EUR3 a month adding mail with professional collaboration services. "I call that 'insert coin, get email out,'" he says. Dufour expects communities of interest with democratic governance, where users vote on quotas and new servers, and a society "a bit less impressed by the new features."

So how do current builds help to redecentralize email hosting? On open standards, open source teams have rebuilt the server and the client and are now rebuilding the storage underneath. Whatever keeps an organization from running its own email as most did at the start, someone in open source is working on that problem. Where the fix isn't ready yet, it's on the way. And it won't take a hyperscaler to manage.

Links for Further Reading

- *Two Providers, a Stubborn Plateau and a Very Long Tail: Email in the Tranco Top-1M (RIPE Labs)*
- *Toekomstbestendigheid Belastingdienst, letter to parliament of October 5, 2026, in Dutch (Tweede Kamer)*
- *Communication on European Tech Sovereignty, accompanied by an EU Open Source Strategy, COM(2026) 503 (European Commission)*
- *The EU Open Source Strategy (European Commission)*
- *NLnet: Email projects supported by NGI Zero*
- *Stalwart: Can Open Source do Gmail-scale Email? (FOSDEM 2026)*
- *Parula: New features on the new email app (FOSDEM 2026)*
- *Aerogramme: A multi-region IMAP server, slides (FOSDEM 2024)*
- *JMAP specifications, including RFC 8620 and RFC 8621 (RFC Editor)*
- *Policy Blocklist (Spamhaus)*

Links for Your Toolkit

A minimum practice for anyone considering self-hosted mail: Check the server's IP address against the common blocklists before you publish an MX record; publish SPF, DKIM, and DMARC on the first day; and decide in advance whether mail to the large providers goes direct or through a relay.

- *Stalwart, mail and collaboration server*
- *Parula, mail and communications client*
- *Aerogramme, distributed IMAP server*
- *Garage, distributed object storage*
- *Mox, mail server*
- *CHATONS, the collective of independent hosting providers*
- *JMAP.io, protocol overview and client and server list*

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