

CALYX INSTITUTE  
ANNUAL  
REPORT

MAY 1<sup>ST</sup>, 2019 — APRIL 30, 2020



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## MISSION & OBJECTIVES

**THE CALYX INSTITUTE** is a not-for-profit education and research organization devoted to studying, testing, developing, and implementing privacy technology and tools to promote free speech, free expression, civic engagement, and privacy rights on the Internet and in the mobile telephone industry.

The mission of The Calyx Institute is to educate the public about the importance of privacy in digital communications and to develop building blocks that Internet users and service providers alike can use to build “privacy by design” into their Internet experience. Calyx seeks to incorporate privacy and anonymity controls into services at root levels, and make these controls easy for all people to access and use. In order to achieve the ultimate goal of reinforcing the fundamental right to freedom of expression, we seek to make robust privacy tools and ubiquitous strong encryption available to everyone.

# LETTER FROM THE EXECUTIVE DIRECTOR



**WHAT A YEAR.** As the danger of COVID-19 shifts work, communities, and our social lives online, it is more important than ever to ensure the privacy and security of telecommunications networks and devices. The privacy guarantees of face-to-face contact are dissolving as local and national economies move to telework, and communities follow social distancing guidelines in the face of the worst global pandemic in over a century. Meanwhile, legislators in the United States continue to debate ways to limit the widespread adoption of end-to-end encryption, and to increase the warrantless mass collection of web browsing histories and telephone call records.

However, the optimists among us note that at least CCTV and facial recognition software will struggle to identify and track us with the widespread adoption of masks. We'll take the good news where we can find it.

This year, The Calyx Institute has prioritized improvements to our digital services that can immediately assist individuals and communities grappling with this new normal while retaining privacy and assurances of online security. You can read about examples of this in the report below. In many respects, the global shift to online communications has only reinforced the urgency of our existing efforts to create an open-sourced, security-focused telecommunications ecosystem.

The economic contraction that is following the pandemic has drawn resources away from the digital privacy and security community. While The Calyx Institute cannot replace the breadth of small donors or the depth of foundation or corporate giving, we have accelerated our efforts to provide micro-grants to support organizations and projects through short-term financial instability.

Work on our redesigned website and administrative backend, as well as our overhauled membership program, came to fruition at the beginning of the calendar year. This has led to a doubling of financial support from members just as we shifted the entire membership program out of our New York City office.

It is thanks to our dedicated team members, organizational partners, as well as patient and accommodating family members and roommates surrounded by boxes and shipping labels, that we have been able to manage this growth during unprecedented disruptions. In the year to come, we look forward to continued expansion of our program activities, stronger partnerships with our friends and colleagues, and increasingly private and secure telecommunications networks for all. ▼

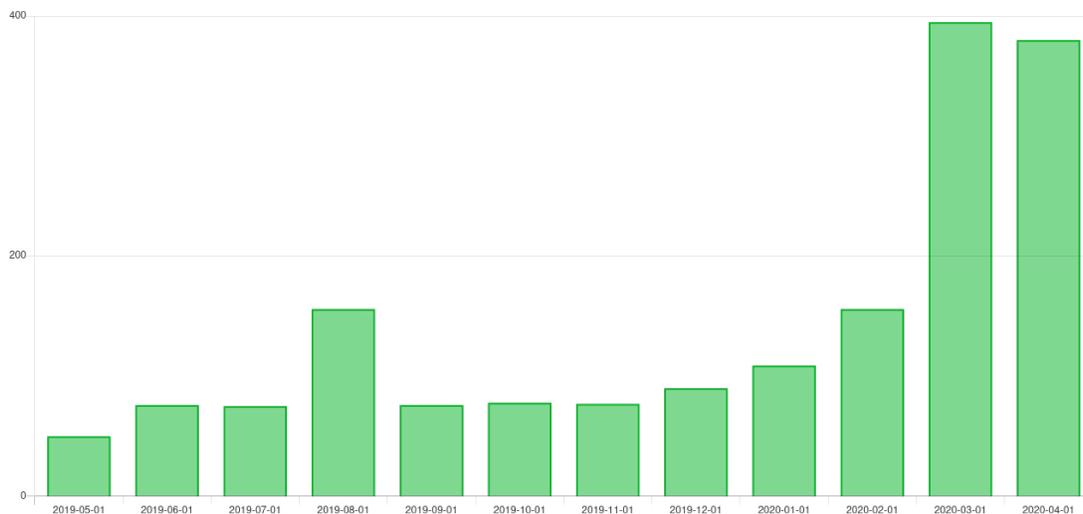
**Nicholas Merrill** — EXECUTIVE DIRECTOR

# MEMBERSHIP PROGRAM

## Membership Growth

**THE CALYX INSTITUTE'S** membership program helps bridge the digital divide in the United States through our wireless hotspot program, while simultaneously providing the primary source of funding for our program activities. The wireless hotspot program, which we offer through a partnership with Mobile Citizen, provides connectivity to underserved communities through annual or quarterly memberships. Members gain access to the Internet throughout the country on Sprint's 4G network, without onerous and often expensive data caps and hidden fees.

The Calyx Institute experienced steady membership growth in the first half of the fiscal year through word-of-mouth, positive press coverage, and an outreach campaign made possible by a generous Google Ads grant. At the beginning of 2020, we relaunched our website and added the option for memberships on a quarterly basis. This led to an explosion of new growth in members. 1,718 new member donors joined The Calyx Institute in the fiscal year, bringing the total active memberships to over 3,500.



We continue to work diligently to support our members through timely responses to questions and requests for assistance, information about digital privacy and online security, and by directing them to our digital services program.

## A New Look

At the beginning of 2020, we launched a new public-facing website and rebuilt our membership database and administrative backend from the ground up. The new website presents visitors with a cleaner interface for ease of navigation. In addition to a brighter and more welcoming appearance, the new site is also responsive for mobile devices and loads more quickly. The website is built according to our “privacy by design” principles, and features no trackers and the minimal amount of cookies required to allow members to log in.

In addition to the public facing website, we built Petal: a new backend for membership management and systems administration. Petal, which replaces our previous backend system that ran on CiviCRM, was built specifically for The Calyx Institute, and provides a strong foundation for our growing Membership Program through improved user experience, security, and ease of use by the system’s administrators. We are working to ready Petal for launch as a generic membership management system for use by other organizations.

Petal also offers improved security features, including a completely Javascript-free web application, improved password storage, and a total separation between admin and user functions. Users will experience an easier membership enrollment process, support for additional cryptocurrencies, an easy path to change membership type, and the ability to view their contribution history. For our staff that work on the Membership Program, Petal makes available more granular insight into our inventory and automates many of the previously manual tasks that are necessary to support our members.

# DIGITAL SERVICES

**THE CALYX INSTITUTE** develops and operates a range of digital services to support online privacy and security for the general population and at-risk users. These services run on open source platforms that allow other service providers to use them to build “privacy by design” into their Internet experience. Millions of Internet users around the world directly benefit from our digital services each year as we continue to develop even more robust features and better user experience.

These services are and always will be free to use and free for other service designers to borrow and incorporate into their own platforms. Our commitment to privacy and security means that we keep the minimal amount of information required to run our digital services.

## CalyxVPN

The Calyx Institute operates our own Virtual Private Network (VPN) running on the Bitmask platform. The CalyxVPN is accessible through the Bitmask app on Android, or through the standalone CalyxVPN app on F-Droid. It can carry up to 10 Gb/s of traffic.

CalyxVPN received a major upgrade this year with the support of a grant from Internews to integrate Pluggable Transports with the Bitmask platform and the CalyxVPN implementation. Internet censors can block traffic that’s protected by a VPN by using Deep Packet Inspection (DPI) to target services by filtering packets. Pluggable Transports obfuscate traffic routed through a VPN by making it look just like approved traffic. With Pluggable Transports integration into CalyxVPN, our users have an added defense against DPI blocking.

## Tor Hosting

Support for the Tor Network, an online anonymity and censorship circumvention platform developed by The Tor Project, is a keystone of The Calyx Institute’s program activities. We have contributed to and supported the Tor network since our founding, by both hosting relays that carry traffic on the network, and through innovative uses of the Tor network in conjunction with other software and communications platforms, such as Mumble, Jabber/XMPP, and the CalyxOS operating system. The Calyx Institute also hosts an official mirror of the Tor Project site to allow users to find more information about Tor and to download the Tor Browser if the main website is blocked.

This year, we expanded the number of Tor relays we host by adding an additional 6 servers, bringing our total relays to 20 as of the end of this fiscal year (April 30, 2020). These servers can carry approximately 3.5 Gb/s of peak traffic on the Tor network. Up-to-date statistics are available on the [Tor Metric page](#).

### Online Chat

The Calyx Institute operates an experimental free public conferencing server that provides chat service using XMPP, the open-standards protocol for instant messages and voice communication. The server, which is also reachable via a Tor Onion Service, currently supports over 250,000 accounts. Our server receives an “A” Grade from xmpp.net’s IM Observatory test.

In response to the pandemic-driven increase in demand for secure video conferencing software, we upgraded and expanded our hosting of Jitsi, a secure online video conferencing tool, to carry more traffic and present a smoother, cleaner experience for users. We also host an instance of the voice chat application Mumble, available through the regular web as well as through Tor Onion Services.

### F-Droid Hosting

F-Droid is a catalogue of open source applications for the Android platform which users can download onto their phones. This year, we took over website build and deploy duties, hosting the code that builds the F-Droid site. F-Droid’s website is one of the largest that is generated using a static site generator. This makes the build and deploy process resource-intensive and time-consuming. Additionally, we also provide server resources to F-Droid to build all the apps available on the client. Because F-Droid is a key component to many of our projects, we prioritize supporting the project with resources and code contributions.

# ANDROID DEVELOPMENT

## CalyxOS



**WE CONTINUED TO** develop the CalyxOS operating system. This year we added compatibility for Pixel 3a, 3aXL, and 4 phones, as well as to the Mi A2 phone, bringing the number of compatible devices to nine. We continue to work to make CalyxOS available on more affordable devices.

The CalyxOS operating system continued to receive improvements this year. The first CalyxOS update based on the Android Q release was built less than one month after source code release by Google. We automated more of the CalyxOS support and maintenance, including signing the OS and Calyx-developed app releases with a script. Lastly, we made dramatic usability improvements, including microG location providers for maps, improvements to the Setup Wizard, and we increased collaboration with upstream developers, including contributing patches.

## SeedVault

We debuted SeedVault, an open-source encrypted backup app for inclusion in Android-based operating systems. SeedVault allows users of Android-based operating systems that incorporate it to store their phone data without relying on Google's proprietary cloud storage. Users can decide where their phone's backup will be stored, with options ranging from a USB flash drive to a remote self-hosted cloud storage alternative such as NextCloud. Seedvault also offers an Auto-Restore feature: instead of permanently losing all data for an app when it is uninstalled, Seedvault's Auto-Restore will restore all backed-up data for the app upon reinstallation.

SeedVault is part of our larger efforts to allow users to move their data away from privacy-invasive and security-compromised platforms. By using client-side encryption to protect all backed-up data and giving users control over where their Android phone's data is stored outside of Google's reach, SeedVault offers users increased data privacy with minimal hassle.

SeedVault is currently included in CalyxOS and the GrapheneOS Android-based operating systems.

## Android Vulnerability

Our research and development on Android and the CalyxOS operating system led us to discover a security vulnerability in the Android operating system used by billions of devices globally, catalogued as CVE-2019-9436. This vulnerability in the Android kernel in the bootloader allowed a possible secure boot bypass, which could lead to local escalation of privilege with System execution privileges needed in the Pixel 2XL device. We reported the vulnerability to Google who then developed a bug fix for the problem which was corrected in Android and the change was pushed to Android phones around the world, improving security over in the Android ecosystem.

# COMMUNITY SUPPORT

## Micro-Grants Program

**THIS YEAR, WE** piloted a micro-grants program to support individuals, projects, and organizations that advance The Calyx Institute’s mission. This program supports digital security and privacy education and software development through micro-grants (\$2,500 - \$7,500) that provide crucial and timely support to practitioners whose projects’ scopes fall below the scope of other funders. Beginning in January 2020, this program funded \$9,089.45 to the following three projects:

Tech Learning Collective (TLC), which provides a security-first IT infrastructure curriculum to otherwise underserved communities and organizations advancing social justice causes. TLC will develop an online intermediate-level digital security lab to teach users the basics of how to operate self-hosted digital infrastructure.

Daily publication of the court transcripts of the UNITED STATES OF AMERICA v. JOSHUA ADAM SCHULTE trial to assist journalists and reporters in covering the court case of the accused Vault 7 leaker. The Vault 7 leaks were one of the largest leaks of information from the CIA, and understanding what happened and how the U.S. government responded is crucial for the public’s knowledge of the privacy and security vulnerabilities the world’s digital networks face. Journalists from outlets such as Politico and Cyberscoop used the transcripts to report on the trial. The transcripts are hosted by independent journalist and researcher Alexa O’Brien, along with trial exhibits and court materials provided by others.

MuckRock Foundation’s Hacking History FOIA project, which aims to educate the public on the cyber domain, government investigations, and hacktivism by identifying and filing Freedom of Information Act (FOIA) requests for the hundreds of thousands of pages of documents on hackers, hacking groups, and high profile hacks. With over 500 FOIA requests filed, this project will inform the public’s understanding of the political and legal dimensions of online privacy, digital speech and political organizing, and criminal law relating to cybersecurity through the release and analysis of primary source documents.

# CONFERENCES & CONVENINGS



**CALYX REMAINED ENGAGED** with our colleagues, friends, and partners in the privacy and technology community. We have continued to sponsor CryptoHarlem, the digital surveillance and cybersecurity clinic run in the Harlem neighborhood of New York City. We also experimented with bringing friends and colleagues to our office in Brooklyn for our Lunch and Learn livestreams.

The Calyx Institute supported the digital security community in New York City by hosting five monthly meetups in New York City as part of the global Coffee and Circumvention series. These meetups are held on the third Thursday of each month in various cities throughout the world. They bring together technologists, artists, journalists, citizens and, others interested in digital rights, on-line privacy and security, and open technology.

At the end of 2019, our Executive Director Nick Merrill ran a workshop at the Hackers Next Door conference in NYC on Legal hackers, which brought together lawyers, activists and technologists to discuss cryptography, protecting confidential data, and confronting government surveillance in light of the NSA's dragnet data collection program. We also made our annual appearance at DEF-CON in Las Vegas, to huge success.

Although the Internet Freedom Festival (IFF), originally scheduled for April 2020, was wisely cancelled this year due to the COVID-19 pandemic, we are proud to provide financial support to ensure that this key event will be held after the public health crisis is over.

# GROWTH & CHANGE

## Weathering a Pandemic

The Calyx Institute shut down our New York City office and switched to remote work several days before New York City and New York State's nonessential business shutdown on March 22, 2020. In doing so, we were able to prioritize the health and safety of our team while ensuring that we can continue to support our members and advance The Calyx Institute's mission.

Supply chain disruptions delayed some wireless hotspot shipments and we were unable to receive new shipments of Calyx branded T-Shirts to send to new members at the end of the fiscal year. Despite this, our membership program continued to meet member needs and communicate delays and difficulties quickly and effectively to our members.

As noted above, the global health crisis disrupted our ability to attend several conferences and convenings which we were scheduled to appear at, and have forced us to indefinitely delay what was to be the first annual summit of Calyx Institute staff, board, and friends.

## Staff Expansion

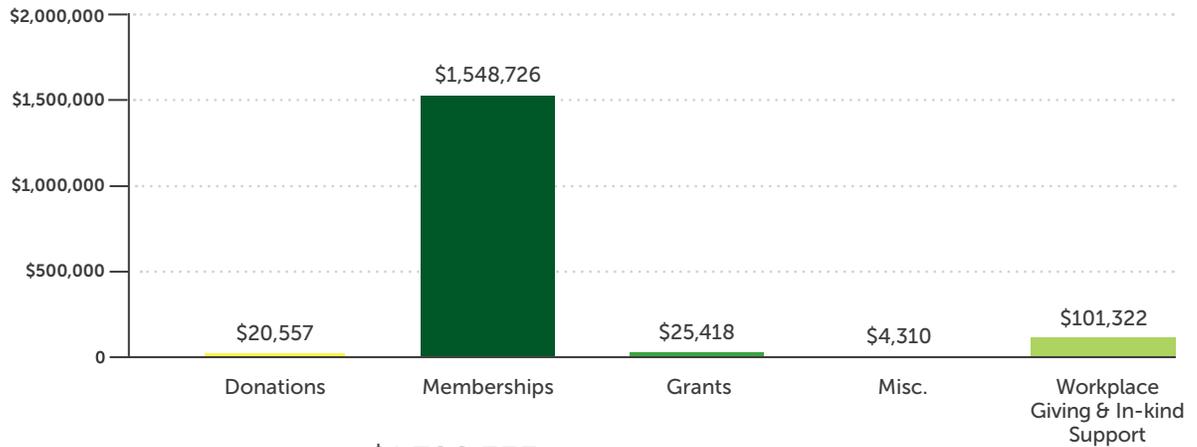


We hired a full-time Senior Technologist, Elijah Waxwing, in November of 2019. Working from Washington state, Elijah brings over 20 years of experience working on digital justice issues. A software developer, systems architect, information security specialist, and manager, Elijah will work as a webmaster, web application programmer, and systems developer.

# FINANCIALS

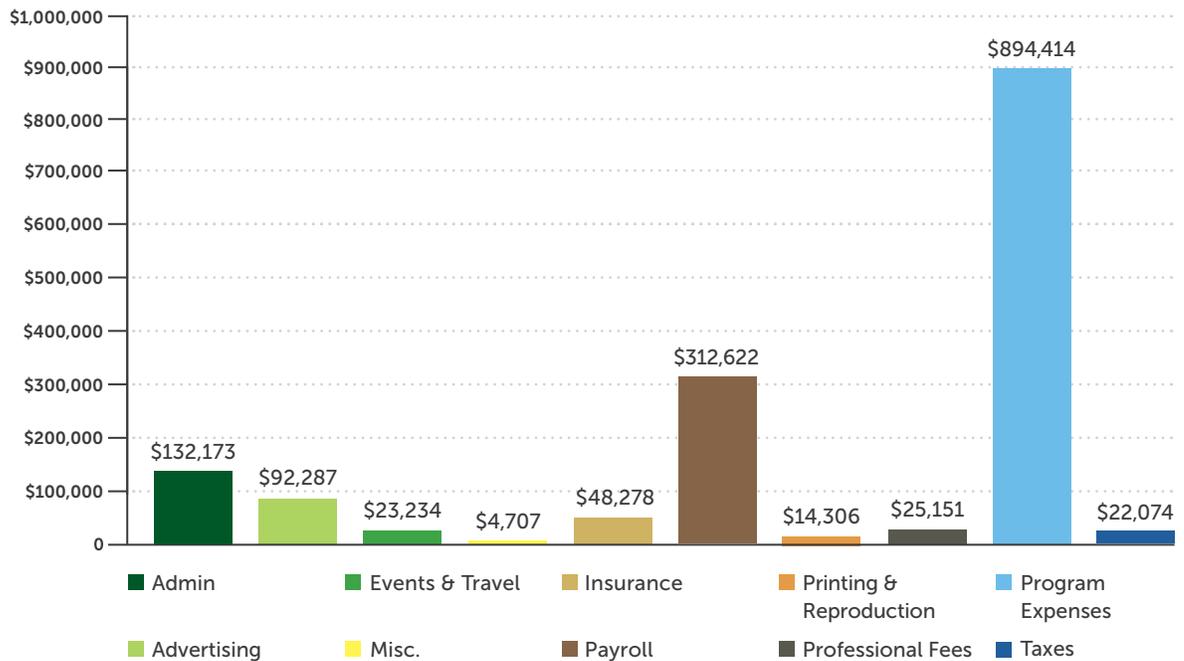
**CALYX RECEIVED** the majority of our funding through our growing membership program.

## Revenue



Total Revenue – \$1,700,333

## Expenses



Total Expenses – \$1,569,246

Net Income – \$131,087

CALYX

