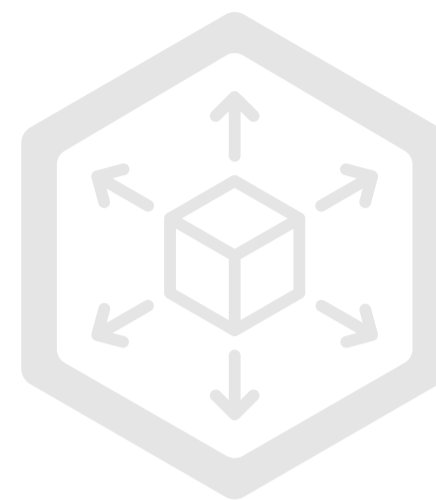


Infinitely Scalable: The FCC's Electronic Comment Filing System

Challenge

The FCC Electronic Comment Filing System (ECFS) enables the public to submit comments on FCC proceedings. It is an important tool for the FCC's rulemaking process, allowing the public to have a voice in developing the rules that affect the nation's telecommunications and broadcast infrastructure. The previous version of ECFS had crashed more than once during periods of very high traffic, including when a late night TV host urged viewers to comment in large numbers. The system suffered from security vulnerabilities that could not be easily remediated due to a complex architecture that made it nearly impossible to perform updates to individual system components without rewriting the entire application. The FCC wanted to overhaul ECFS so that it would be "infinitely scalable" to meet future surges in demand, and assure the public and Congress of the security of data submitted and received.



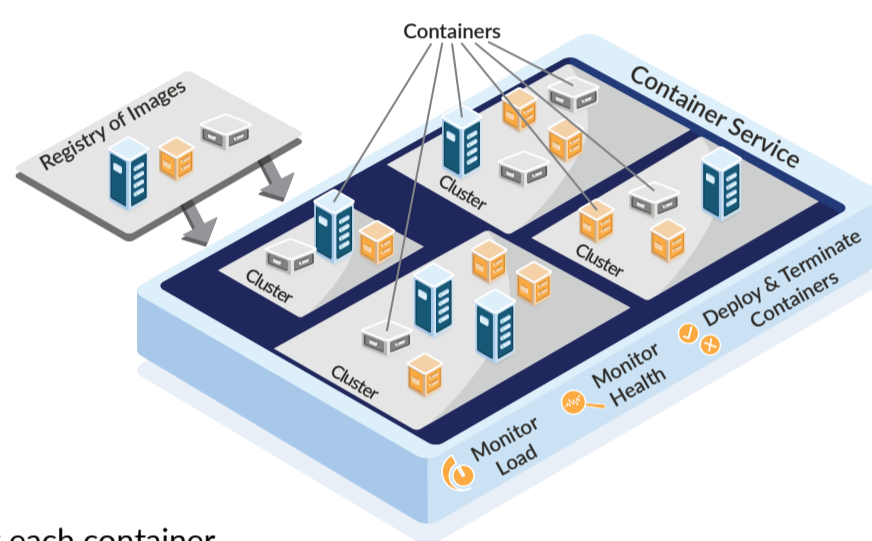
Solution

To meet these goals, TCG worked with the FCC to implement a cloud-first architecture. The core of the system uses AWS's Elastic Container Service (ECS) to dynamically manage, or "orchestrate", multiple containers. A container is a lightweight virtual machine that can be thought of as a single server. The orchestrator manages the deployment, monitoring, and termination of containers.

This kind of architecture reduces single points of failure, increasing reliability. It also creates cost savings by throttling back computing power when demand is light and increasing it when there are surges in demand.

Vertical and Horizontal Scaling

The new architecture allows for both "vertical" and "horizontal" scaling. Vertical scaling provisions containers with additional virtual CPUs and more memory. Horizontal scaling dynamically deploys or terminates additional containers in response to increased or decreased demand.



Independent Containers

A critical aspect of designing software for the cloud is ensuring that each container is independent of other containers and performs an "atomic" service. Typically, many containers are running at any given time. While a container can make use of other services, which may themselves be provided by a redundant group of different containers, each container is disposable and can be stopped or started without affecting the overall functionality of the system; think lots of interchangeable worker ants all coordinating to maintain the colony.

TCG designed the ECFS application as a fleet of containers that employ Terraform for scripted deployment of infrastructure; NodeJS, Typescript, and React as the software stack; and AWS S3 for object storage. ECFS was built so that updates could be performed on specific components without affecting others, improving system resiliency and stability even further. To improve the system's security posture, we added automated Veracode security scans for identification of high or medium level threats and issues that must be addressed before code is deployed to production. Additionally, we made the ECFS application Section 508 compliant by building compliance into the code, eliminating the need for AudioEye (a screen reader tool that was part of ECFS's previous architecture).

Load Testing

Working to achieve sufficient throughput was an ongoing process involving TCG, another vendor who was responsible for writing test scripts, and FCC's security team. Each day the team carefully reviewed the previous day's load testing and worked to resolve any issues that surfaced. The team performed several iterations of load testing to ensure that the system could handle the anticipated volume of comments. They also conducted unit and integration testing as part of the standard deployment process. Late additions to the architecture included reCAPTCHA to mitigate attacks from bots, and the addition of a content delivery network to smooth traffic to the site, preventing overload.

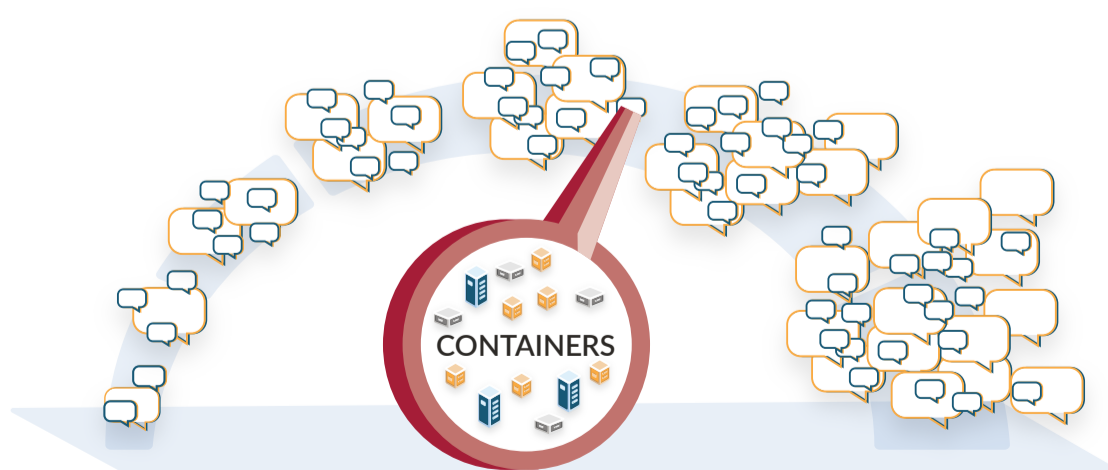
Results

TCG's efforts have resulted in success in two major areas:

The new architecture has significantly improved the vulnerability remediation process for ECFS. Recently, two components were determined to be out of date. We upgraded each of them individually **without any resulting disruption to the system.**

ECFS was put to the test in July of this year and passed with flying colors. When Dish Network proposed to use the 12GHz radio spectrum for a 5G cellular network, SpaceX claimed that the plan would make Starlink "unusable" and urged Starlink users to sign a [petition](#) protesting Dish's initiative. A citizen signing the petition resulted in an automatic filing of a comment in ECFS.

Within a week, ECFS had accumulated 70,000 comments originating from petition signatures, with the number eventually reaching 95,000. Yet, the increase in traffic barely registered for the ECFS team. Though the spike was noted, **ECFS response time never wavered as the system scaled automatically to meet the demand.**



While no system can grow without bounds, thanks to the horizontal and vertical scaling of containers, a cloud-based system architected for AWS Elastic Container Service can rise to the challenge of high volume, "news-worthy" traffic.

For more information:
To learn more about TCG's work with Cloud technologies, contact us at talktous@tcg.com.