# Lessons from ACME

How to ~~win friends and influence people~~
make an specification that people will actually use

Richard Barnes + Aaron Gable, SAAG @ IETF 117

**“In recent years, the SEC ADs have tried to showcase successful adoption of a security-related technologies developed by the IETF during the face-to-face SAAG meeting.”**

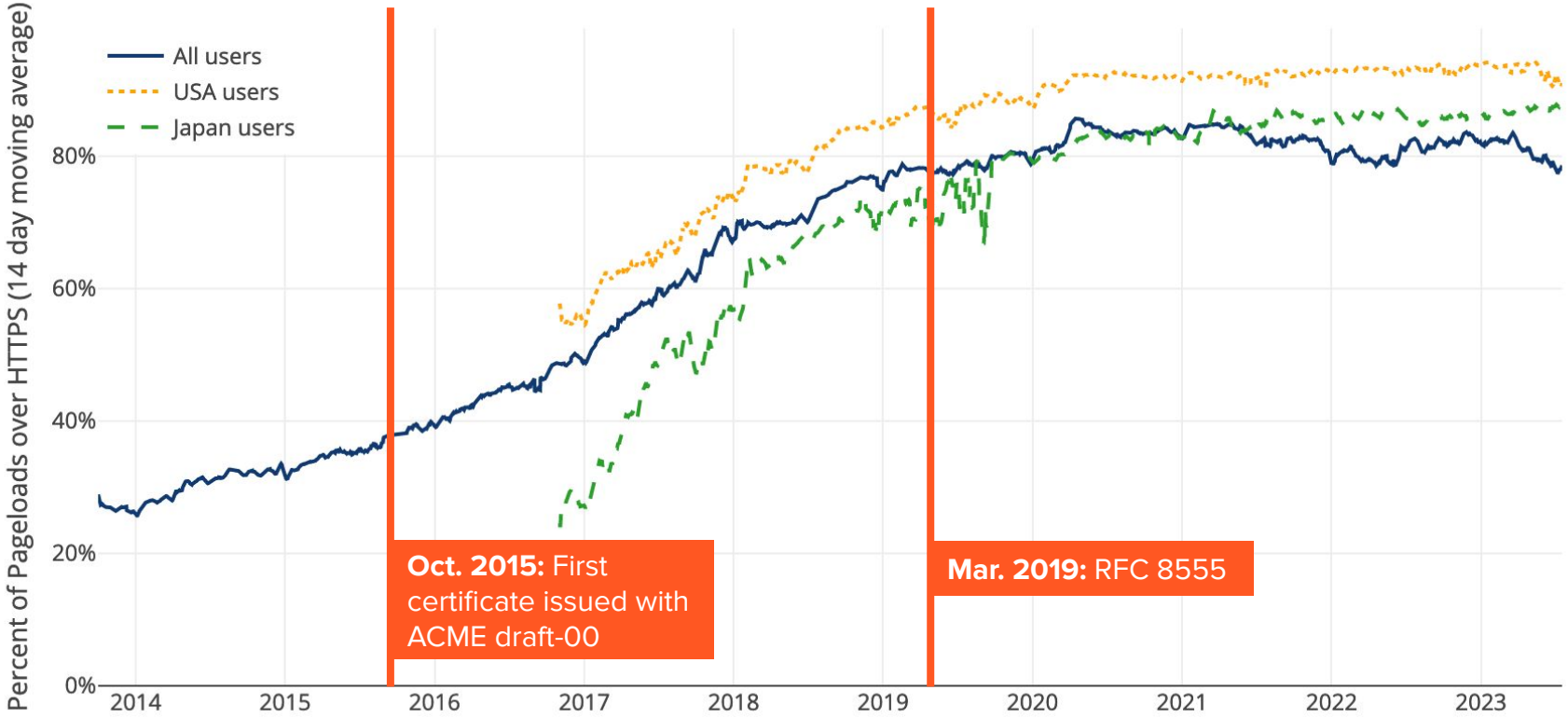
***— Roman Danyliw***

# Has ACME been successful?


ACME

# Percentage of Web Pages Loaded by Firefox Using HTTPS

(14-day moving average, source: Firefox Telemetry)



# ACME Drives the Web PKI

**CAs that support ACME have >95% market share**

| Certificate Authority | Market Share |
|---|---|
| Let's Encrypt | 62.7% |
| Sectigo | 12.9% |
| DigiCert Group | 9.8% |
| GlobalSign | 9.1% |
| GoDaddy Group | 0.2% |
| Certum | 0.7% |
| Actalis | 0.4% |
| Secom Trust | 0.4% |
| Entrust | 0.1% |
| Others | 3.7% |

**Vibrant Software Ecosystem**

**Server side:**

- Boulder (Let's Encrypt CA)
- Smallstep
- EJBCA

**Client side:**

- Integrations with web servers: Apache, Nginx, Caddy, Kubernetes
- Stand-alone: LEGO, acme.sh

ACME—IS—UPTIME

# Other Applications Have Emerged

Private PKI

## Enable ACME with PKI secrets engine

14min | Vault Interactive

Show Terminal

Reference this often? Create an account to bookmark tutorials.

HTTPS with TLS is the defacto standard for all web traffic today and production use cases require this level of security at a minimum.

Email

## RFC 8823
## Extensions to Automatic Certificate Management Environment for End-User S/MIME Certificates

### Abstract

This document specifies identifiers and challenges required to enable the Automated Certificate Management Environment (ACME) to issue certificates for use by email users that want to use S/MIME.¶

Mobile Device Management

## Automated Certificate Management Environment (ACME) MDM payload settings for Apple devices

You can configure the ACME Certificate payload to obtain certificates from a certificate authority (CA) for Apple devices enrolled in a mobile device management (MDM) solution. ACME is modern alternative to SCEP. It is a protocol for requesting and installing certificates. Use of ACME is required when using Managed Device Attestation.

Telephony

## TNAuthList profile of ACME Authority Token

### Abstract

This document defines a profile of the Automated Certificate Management Environment (ACME) Authority Token for the automated and authorized creation of certificates for VoIP Telephone Providers to support Secure Telephony Identity (STI) using the TNAuthList defined by STI certificates.

# Why has ACME been successful?

1. Ship it
2. Embrace and extend
3. Just enough extensibility
4. Formal validation
5. Just GREASE it

# Ship It

**What:**

- Deploy early drafts to production
- Upgrade when the RFC gets done

**In ACME:** Let's Encrypt shipped draft-00

**Why:**

- Build demand – show that it's useful
- Kick-start the software ecosystem
- Learn things to feed into the standards process
- Don't be afraid of the upgrade, it's not that hard
    - … especially if you plan for it from the start!

# Embrace and Extend

**What:**

- Take seriously the way things are done today
- Give folks a clear upgrade path to your protocol

**In ACME:** External account binding, order flow

**Why:**

- Incorporate the best of the prior art
- Make clear that people are welcome
- Reduce the barriers to using the standard

# Just Enough Extensibility

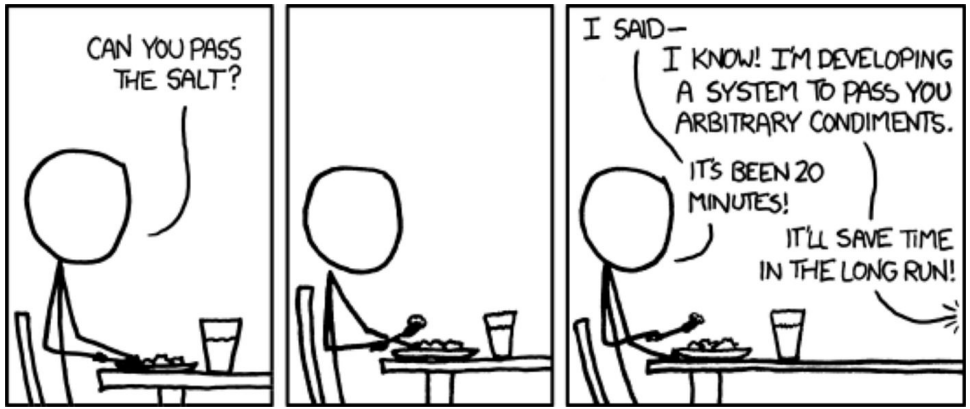
**What:**

- Have extension points where they are natural
- Follow the shape of the use case
- YAGNI still applies

**In ACME:** Validation methods, identifier types

**Why:**

- Future-proofing
- Applicability to new use cases
- … without adding confusion



# Formal Validation

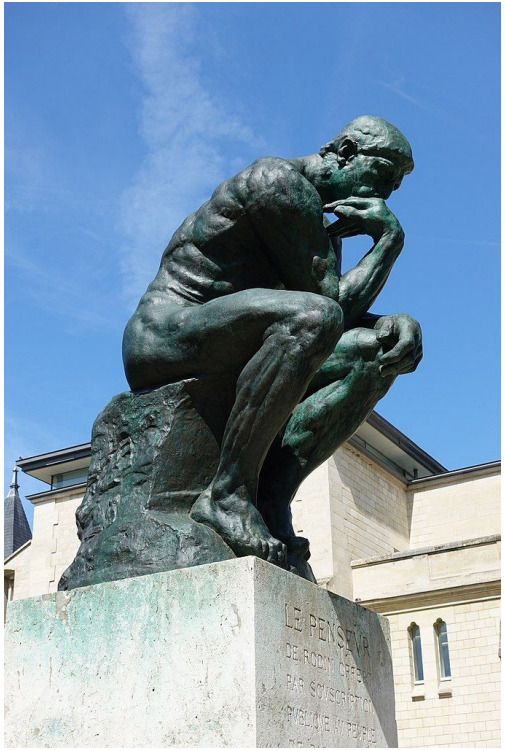
**What:**

- Get formal models to verify the security of the protocol

**In ACME:** Found bugs in of EAB, key roll-over

**Why:**

- Gets smart academic folks involved in the WG
- Often finds interesting bugs
- Builds trust in the standard



# Just GREASE It

**What:**

- Add random values to exercise points where implementations are supposed to be flexible [RFC8701]

**In ACME:** Didn't do this, wish we had

**Why:**

- If your protocol succeeds, there will be a whole ecosystem of clients / servers
- Need to have consistent expectations
- Developers respond to pain

# Summary

1. Ship it
2. Embrace and extend
3. Just enough extensibility
4. Formal validation
5. Just GREASE it