QUANTUM PKI
Your Key to Digital Freedom

WHITE PAPER | MARCH 2026

The 47-Day Future

Why Quantum-Ready PKI and Automation Are Now Essential

47
Day certificate lifetime by 2029

8x
Renewal frequency increase

81%
Orgs hit by cert outages

EXECUTIVE SUMMARY

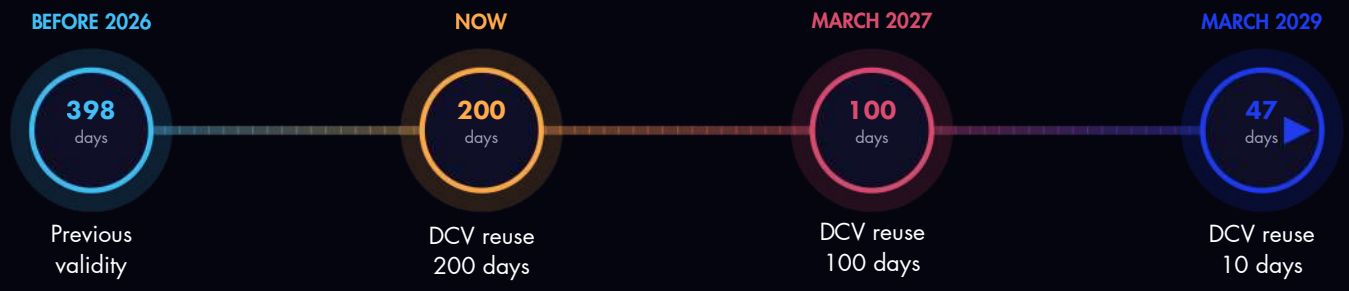
The Countdown Has Begun

Public TLS certificate lifetimes are being shortened on a fixed industry timeline: **398 days** (today) → **200 days** (Mar 15, 2026) → **100 days** (Mar 15, 2027) → **47 days** (Mar 15, 2029). This was formalized through the CA/Browser Forum Ballot SC-081v3, approved by all major browsers and leading CAs.

In parallel, NIST has finalized the first three post-quantum cryptography (PQC) standards — **FIPS 203 (ML-KEM)**, **FIPS 204 (ML-DSA)**, and **FIPS 205 (SLH-DSA)** — ushering in a multi-year migration away from RSA/ECC.

These two forces — short-lived certificates and PQC migration — dramatically increase operational load. The only sustainable approach is **automated certificate lifecycle management (CLM)** integrated with a **quantum-ready PKI (QPKI)**.

CERTIFICATE VALIDITY REDUCTION TIMELINE



As digital ecosystems grow more complex, organizations manage thousands of machine identities, keys, and certificates. Manual certificate management cannot keep pace. Automated certificate lifecycle management eliminates these challenges by ensuring continuous visibility, proactive expiration monitoring, and hands-free renewal and deployment.

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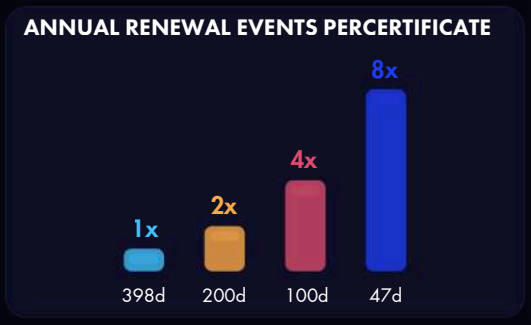
The 47-Day Reality

What's Changing and When

APPROVED TIMELINE FOR PUBLIC TLS CERTIFICATES (issuances on/after):

Mar 15, 2026	Max validity 200 days; DCV reuse 200 days; OV/EV Subject Identity reuse drops to 398 days
Mar 15, 2027	Max validity 100 days; DCV reuse 100 days
Mar 15, 2029	Max validity 47 days; DCV reuse 10 days

Industry analyses emphasize that this **8x renewal frequency** (vs. today's annual cadence) makes automation essential. Your PKI and CLM must operate as a continuous pipeline — auto-discover, validate, issue, deploy, rotate, and attest.



02

Why Manual Certificate Management Fails at Scale

- **Volume & Velocity:** Enterprises handle tens of thousands of certificates; 47-day validity multiplies renewal events.
- **Operational Risk:** 80%+ of organizations have suffered certificate-related outages due to human error or missed renewals.
- **Business Impact:** High-profile outages (Microsoft Teams, Cisco, Spotify) illustrate the cost of a single expired cert.
- **Compliance & Trust:** Shorter DCV reuse windows (→ 10 days) mean more frequent revalidation; manual coordination is a bottleneck.

Bottom line: Manual spreadsheets, ticket queues, and ad-hoc scripts cannot meet the reliability, speed, and evidence requirements of the 47-day era.

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Quantum Is Here

NIST PQC Standards and What They Mean for PKI

In August 2024, NIST finalized **FIPS 203 (ML-KEM)** for key establishment and **FIPS 204 (ML-DSA)** and **FIPS 205 (SLH-DSA)** for digital signatures — effective immediately.

Key takeaway: A modern PKI must become crypto-agile — capable of issuing, managing, and rotating classical, PQC, and hybrid artifacts, with policy controls to phase algorithms as standards evolve.

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Reference Architecture

Core Principles

- **Full-spectrum Discovery:** Continuous inventory of public and private TLS, mTLS, code-signing, device, user, workload, and API certificates across clouds, containers, proxies, and edge.

- **Policy-Driven CLM Automation:** Event-driven issuance/renewal using ACME and API orchestration into load balancers, service meshes, ingress controllers, and app stacks; automated DCV including DNS and HTTP-01/ALPN challenges.

- **Crypto-Agility Controls:** Central policy to select classical (RSA/ECDSA), PQC (ML-KEM/ML-DSA/SLH-DSA), or hybrid profiles by use case and trust boundary; support for test, canary, and staged rollouts.

- **Attestation & Evidence:** Continuous compliance records (who/what/when/where), issuance proofs, DCV logs, and renewal attestations aligned to audits and incident response.

- **Resilience & Scale:** Highly available CA tiers (root, intermediates), HSM integration, automated key ceremonies, and disaster recovery for PKI components. (Industry best practice echoed across major CLM evaluations.)

Logical Components

- **Trust Authority Layer:** Public-trust CAs for external TLS; private/internal CAs for mTLS, devices; sandbox CAs for PQC pilots.

- **QPKI Controller:** Central policy engine and workflow orchestration for issuance, renewal, key-gen, CSR handling, DCV, and hybrid profiles.

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Implementation Roadmap

12-24 Months

Phase 1 — Baseline & Visibility

0-90 DAYS

- Enterprise-wide discovery of all certificates and keys; classify by trust domain and criticality.
- Establish SLOs (e.g., minimum 30-day expiry buffer; zero unknown certs).
- Proveout ACME-based renewals for a high-impact external domain and a Kubernetes ingress path.

Phase 2 — Automation at Scale

3-9 MONTHS

- Roll out policy-driven auto-renew for public TLS aligned to the 200-day milestone (Mar 2026).
- Integrate with load balancers, service meshes, CDNs, and app platforms for hands-free deployment.
- Centralize DCV workflows and evidence capture; implement 10-day DCV rehearsal.

Phase 3 — Crypto-Agility & PQC Pilots

6-18 MONTHS

- Introduce hybrid (classical+PQC) profiles in internal trust zones.
- Validate ML-KEM/ML-DSA/SLH-DSA support across toolchains, HSM/KMS, and libraries.
- Define cutover criteria by application tier; prepare exception handling and fallbacks.

Phase 4 — Governance & Resilience

9-24 MONTHS

- Formalize PKI operations runbooks, automated key ceremonies, and DR plans.
- Implement continuous attestation reporting for audits; add breach/expiry drills.
- Establish executive dashboards tracking coverage, renewal SLOs, and PQC rollout progress.

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How Quantum PKI Services Accelerate Your Journey

- Public (Domain) & internal/PVT CA scanning
- Introduction to certificate automation (prep for shorter lifespans, mandated 03/15/2026)
- Initiating PQC readiness
- PKI Configuration Support — Guidance for Network Infrastructure teams
- Holistic PKI Strategy & Advisory — Aligned with security objectives
- Certificate Lifecycle Management (CLM) Guidance — 'Single Pane of Glass' CLM solutions
- Comprehensive PKI Architecture Support — Root & intermediate CAs, end-entity lifecycle, policy frameworks
- Staff Augmentation — Dedicated PKI expertise
- Customized integrations & Troubleshooting — Seamless operations

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Risk & ROI: Framing the Business Case

81%	8-12x	10d	3
Organizations hit by cert outages	Renewal cycle increase by 2029	DCV reuse window by 2029	NIST PQC standards now finalized

- **Outage Avoidance:** Automation directly mitigates high-probability, high-impact certificate incidents.
- **Operational Efficiency:** 8-12x renewal cycles make manual work economically unsustainable.
- **Regulatory Readiness:** Early PQC pilots de-risk future mandates and supply-chain dependencies.
- **Strategic Agility:** Crypto-agility future-proofs identity and code-signing trust.

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Call to Action

Next 60-90 Days

1. **Run an enterprise discovery** to produce a single, trusted inventory with ownership and criticality tags.
2. **Pilot ACME automation** on at least one external and one Kubernetes-backed workload; measure time-to-renew and failure rates.
3. **Stand up a QPKI working group** (Security, Platform, Networking, App owners) to define crypto-agility and PQC pilot criteria.
4. **Commit to a 200-day readiness checkpoint** (by March 15, 2026): automated renewals, DCV orchestration, and compliance evidence live.

REFERENCES

- CA/Browser Forum (Ballot SC-081v3): official voting results and schedule for reduced validity and data reuse.
- DigiCert, SSL.com, Business Wire/Sectigo: industry explanations of the 47-day change and timelines.
- NIST & Federal Register: formal PQC standards - FIPS 203/204/205 - and effective dates.
- CSA & Lightship Security: practitioner guidance on PQC transitions and ecosystem readiness.
- Gartner Peer Insights (CLM): market definition and evaluation criteria for CLM platforms.
- IBM Insight & industry outage data: operational impacts of 47-day rotations; evidence of outage prevalence.