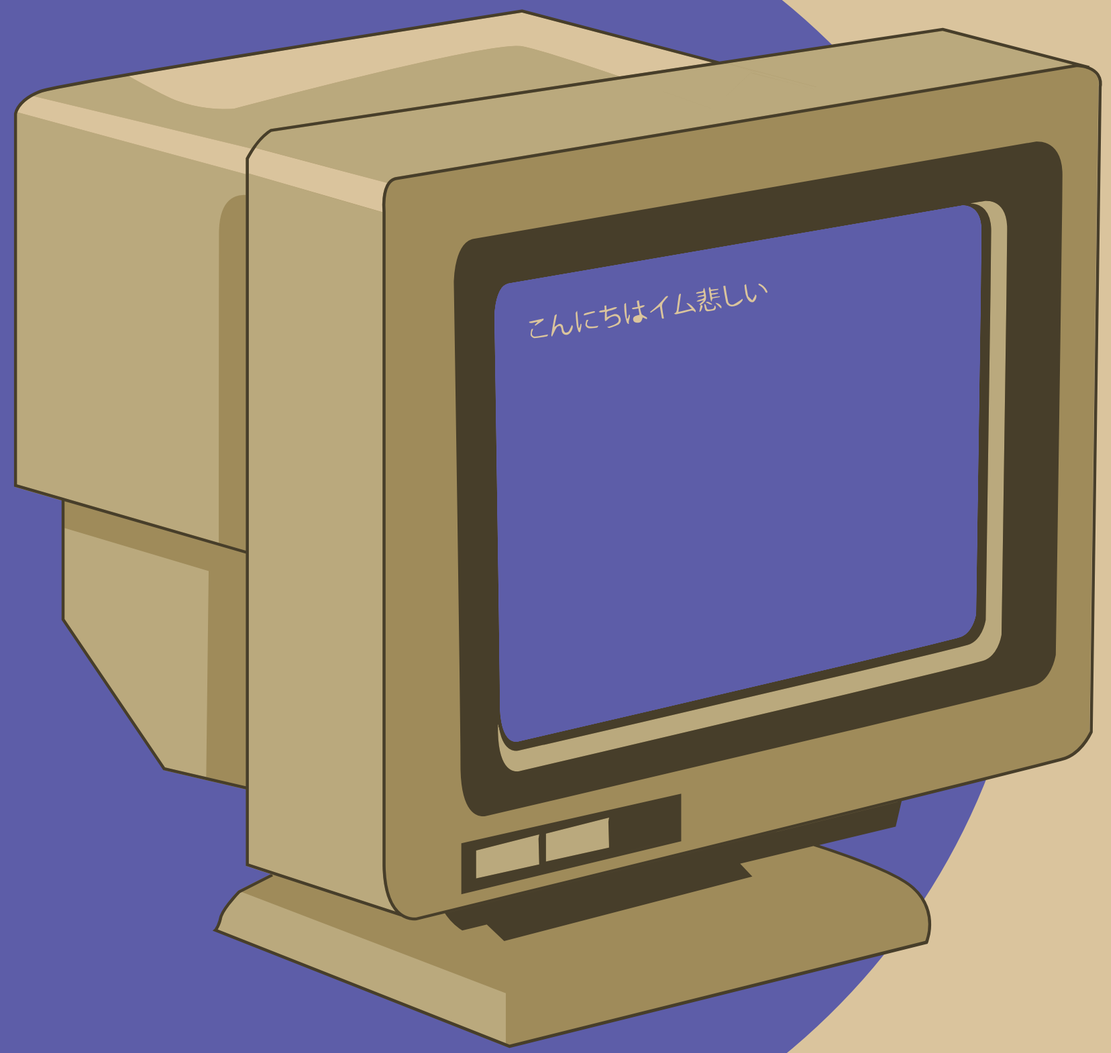


TOOLS PRESENTATION

LIBOQS (OPEN QUANTUM SAFE)

RAGHADE NAWAR
DR. MOHAMED SHAHIN

C LIBRARY FOR PROTOTYPING AND EXPERIMENTING WITH QUANTUM-RESISTANT CRYPTOGRAPHY

LIBOQS (OPEN QUANTUM SAFE)

PRESENTATION OUTLINE

1. What is liboqs?
2. Installation & Setup
3. Cloud/Open Source/Freeware Status
4. Community & Support Forums
5. Who is Using liboqs?
6. Comparison with Similar Tools
7. Tools: liboqs Live Demonstration
8. Conclusion & Resources

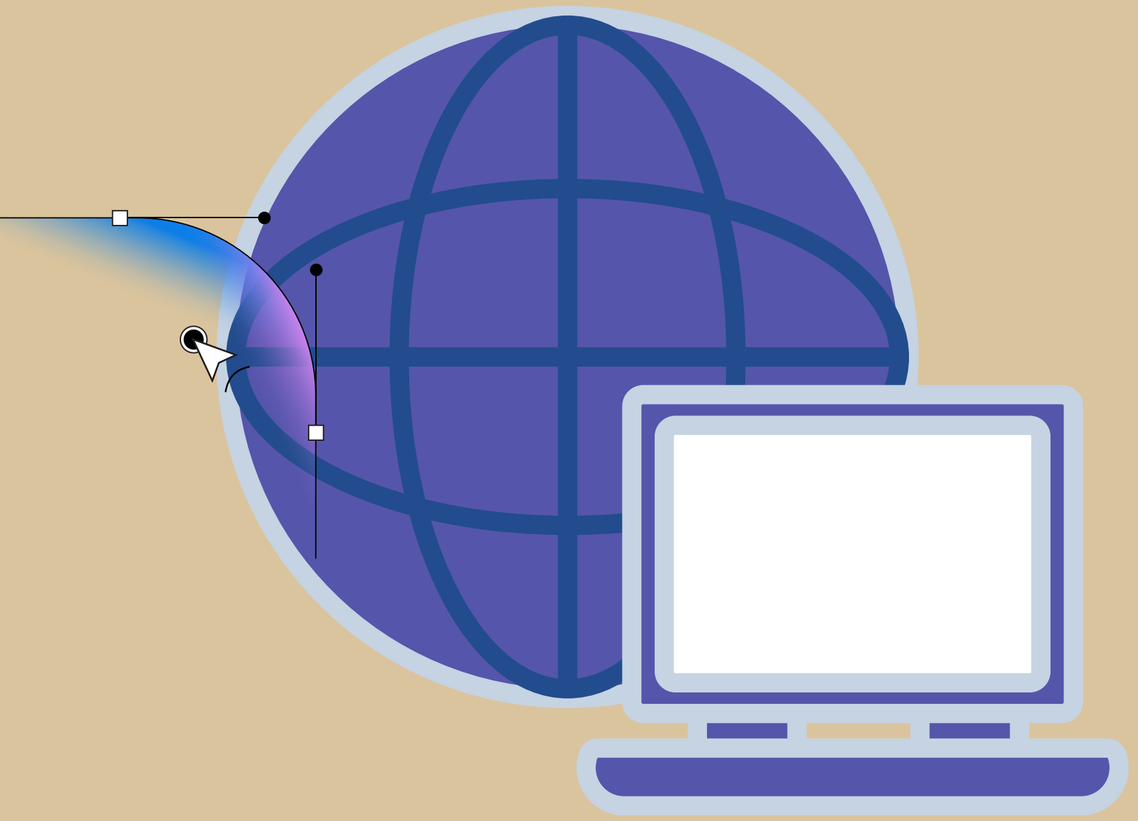
TOOLS PRESENTATION

TOOL OVERVIEW

What is liboqs?

liboqs is an open-source C library for quantum-resistant cryptographic algorithms.
Full Name: Open Quantum Safe - liboqs
Purpose: Provide production-ready implementations of post-quantum cryptographic algorithms
Project: Part of the Open Quantum Safe (OQS) project

LIBOQS (OPEN QUANTUM SAFE)



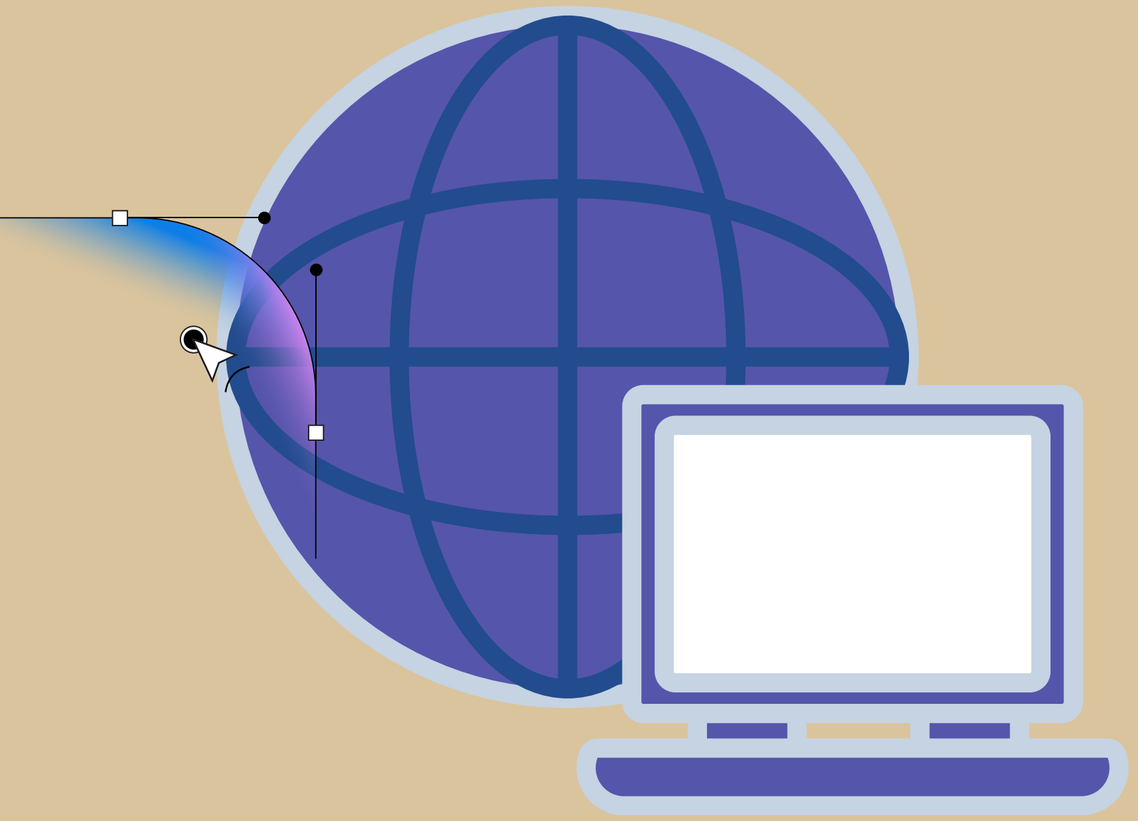
HOW TO GET/INSTALL THE TOOL

Installation Methods

1. From Source (Linux/macOS)

```bash
# Clone the repository
git clone -b main https://github.com/open-quantum-safe/liboqs.git
cd liboqs

# Create build directory
mkdir build && cd build

# Configure with CMake
cmake -DCMAKE_INSTALL_PREFIX=/usr/local ..

# Build
make -j$(nproc)

# Install (may need sudo)
sudo make install
```

LIBOQS (OPEN QUANTUM SAFE)



HOW TO GET/INSTALL THE TOOL

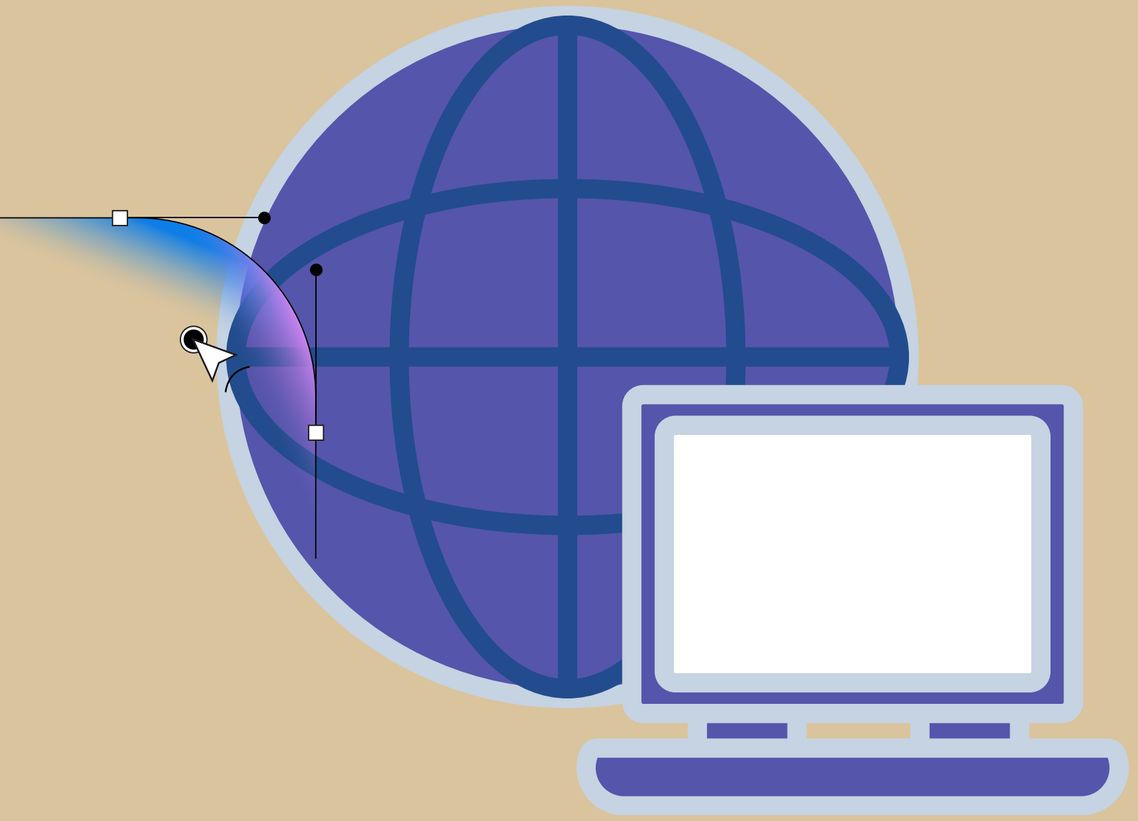
Installation Methods

2. Using Package Managers

Ubuntu/Debian

```bash
# Add OQS repository (if available)
sudo apt-get update
sudo apt-get install liboqs-dev
```

TOOLS PRESENTATION



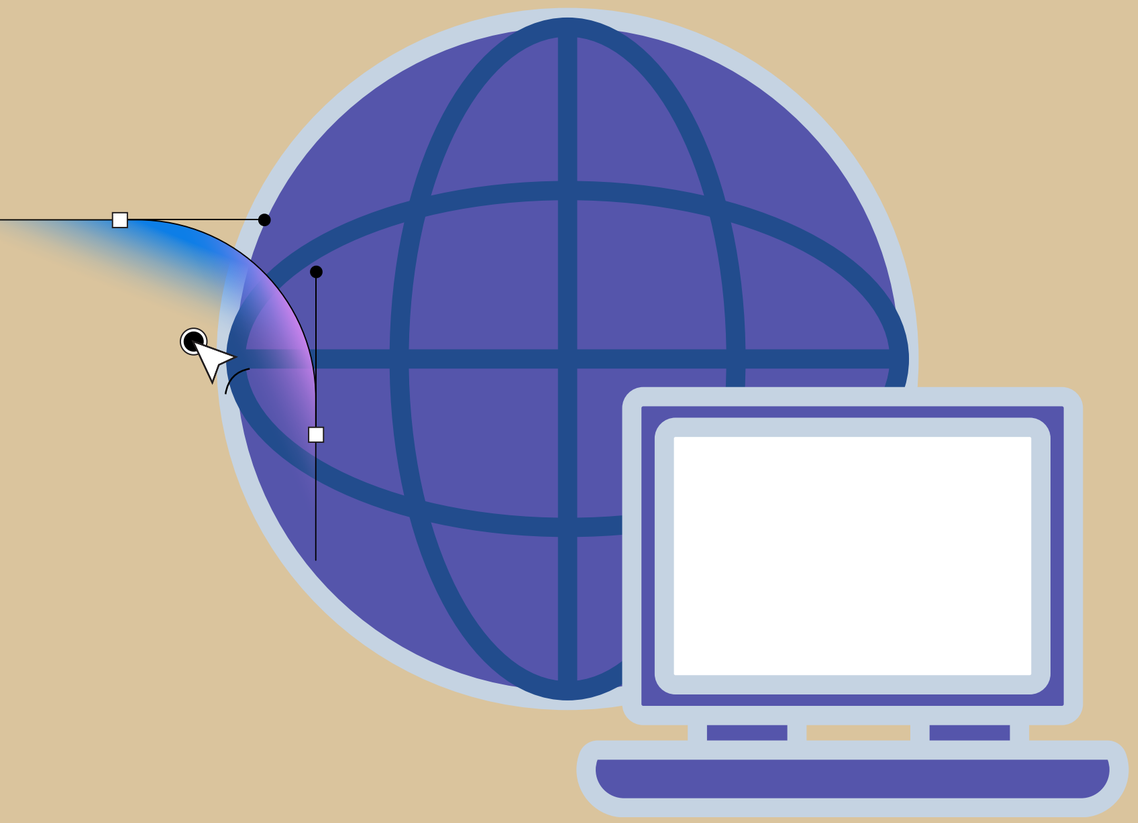
HOW TO GET/INSTALL THE TOOL

Installation Methods

2. Using Package Managers

macOS (Homebrew)

```bash
brew tap open-quantum-safe/liboqs
brew install liboqs
```



HOW TO GET/INSTALL THE TOOL

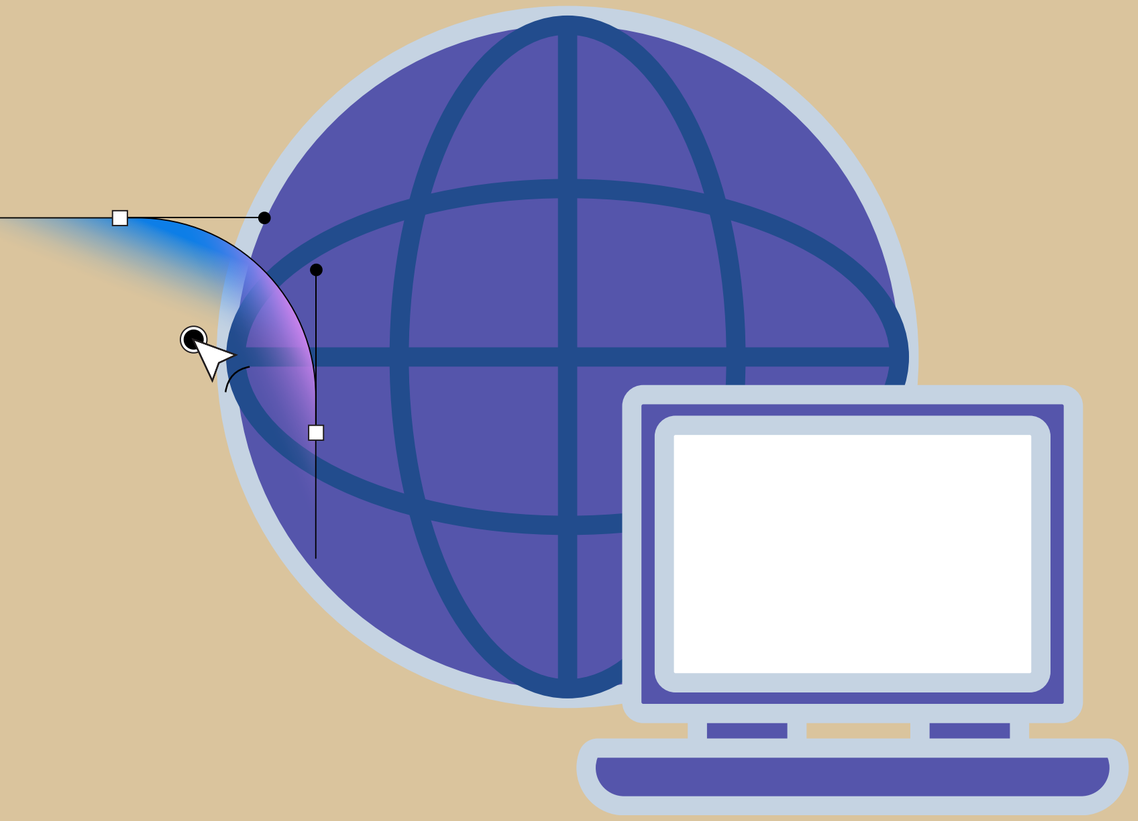
Installation Methods

2. Using Package Managers

Windows (vcpkg)

```bash
vcpkg install liboqs
```

LIBOQS (OPEN QUANTUM SAFE)

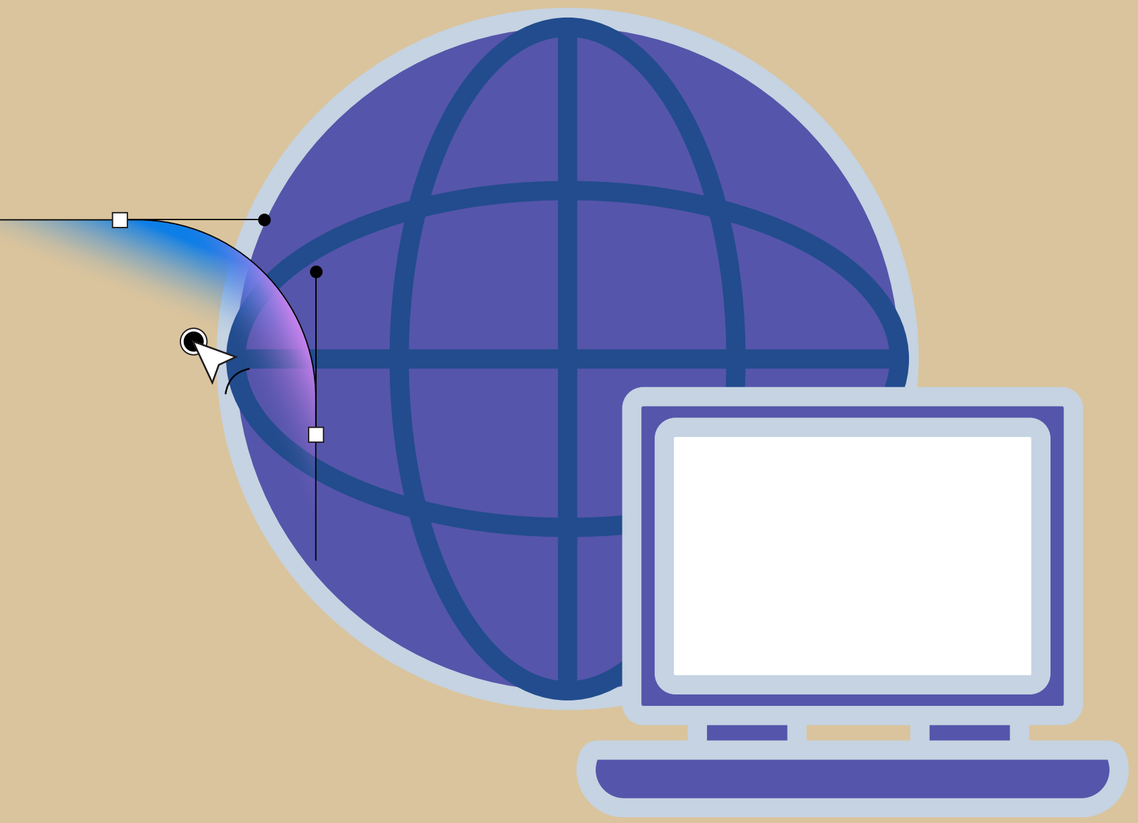


HOW TO GET/INSTALL THE TOOL

Installation Methods

3. Using Docker

```bash
# Pull official Docker image
docker pull openquantumsafe/liboqs

# Run interactive container
docker run -it openquantumsafe/liboqs /bin/bash
```



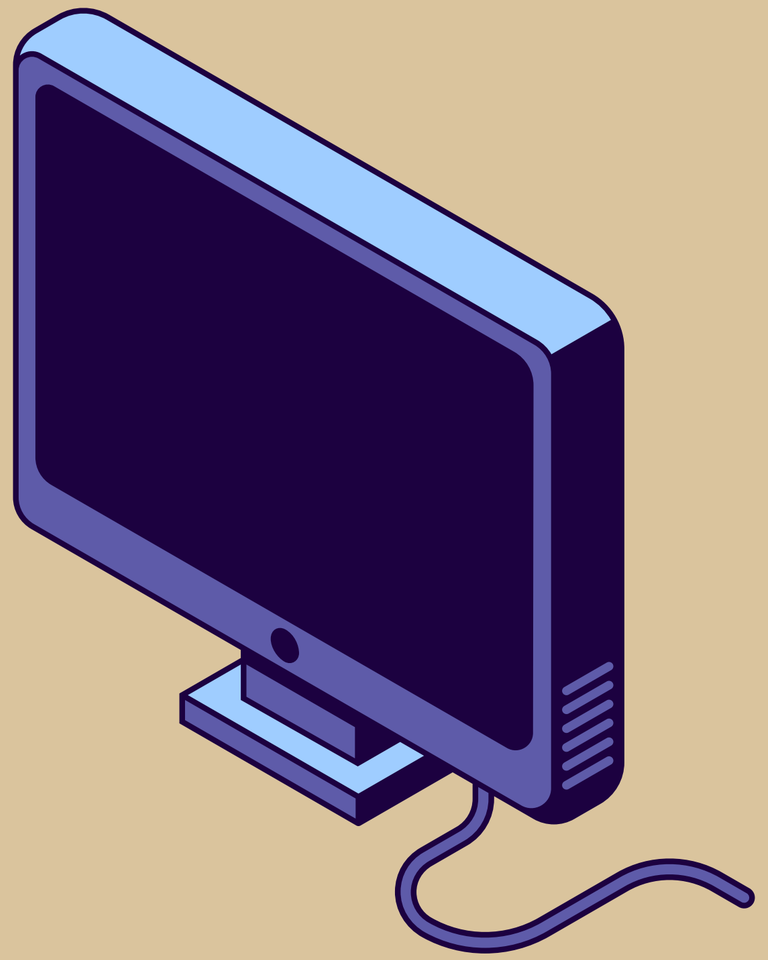
HOW TO GET/INSTALL THE TOOL

Installation Methods

4. Python Bindings

```bash
# Install liboqs-python
pip install liboqs-python
```

BUILD OPTIONS



Configuration Flags

```bash
# Enable all algorithms
cmake -DOQS_ENABLE_KEM_KYBER=ON \
      -DOQS_ENABLE_SIG_DILITHIUM=ON \
      -DOQS_ENABLE_SIG_FALCON=ON \
      -DOQS_ENABLE_SIG_SPHINCS=ON ..

# Disable some algorithms to reduce size
cmake -DOQS_MINIMAL_BUILD=ON ..

# Enable OpenSSL integration
cmake -DOQS_USE_OPENSSL=ON ..
```

LIBOQS (OPEN QUANTUM SAFE)

CLOUD/OPEN SOURCE/FREEWARE STATUS

LICENSE

- **Type:** MIT License
- **Status:** Completely FREE and Open Source
- **Commercial Use:** Allowed
- **Modification:** Allowed
- **Distribution:** Allowed

AVAILABILITY

- **Source Code:** GitHub (public repository)
- **Binary Packages:** Available for major platforms
- **Cloud Ready:** Can be deployed on any cloud platform
- **No Cost:** Completely free to use

CLOUD/OPEN SOURCE/FREEWARE STATUS

REPOSITORY

- **URL:** https://github.com/open-quantum-safe/liboqs
- **Stars:** 1.8k+ (as of Dec 2025)
- **Forks:** 450+
- **Active Development:** Regular updates and releases

CURRENT SUPPORT FORUMS/GROUPS

Official Support Channels

1. GitHub
- Issues: https://github.com/open-quantum-safe/liboqs/issues
- Discussions: https://github.com/open-quantum-safe/liboqs/discussions
- Pull Requests: Active community contributions
- Response Time: Usually within 24-48 hours

2. Documentation
– Main Docs: https://openquantumsafe.org/
- API Reference: https://openquantumsafe.org/liboqs/
- Wiki: Comprehensive guides and tutorials

2. Stack Overflow
- Tag:[post-quantum-cryptography], [liboqs]
- Community: Growing PQC community
- Questions: ~100+ related questions

Community Size
- Contributors: 50+ active contributors
- Organizations: Supported by industry and academia
- Users: Thousands of downloads per month
- Global: Worldwide community

LIBOQS (OPEN QUANTUM SAFE)

WHO IS UTILIZING IT AND HOW FAMOUS?

Industry

1. Cloud Providers

- Cloudflare: Uses OQS for HTTPS experiments
- AWS: Testing PQC integration
- Microsoft: Azure experiments with PQC

2. Software Companies

- Mozilla Firefox: PQC testing
- Google Chrome: CECPQ experiments
- Apple: iOS/macOS security research

3. Security Companies

- Cisco: Network equipment PQC
- Fortinet: Firewall PQC support
- Palo Alto Networks: Security appliances

TOOLS PRESENTATION

LIBOQS (OPEN QUANTUM SAFE)

WHO IS UTILIZING IT AND HOW FAMOUS?

Academia
Leading Universities
- MIT, Stanford, UC Berkeley
- KU Leuven, TU Eindhoven
- Waterloo (Institute for Quantum Computing)
- Used in research and teaching

WHO IS UTILIZING IT AND HOW FAMOUS?

Government Agencies

- NIST: Reference for PQC standardization
- NSA: Evaluation and testing
- European Commission: PQCRYPTO project
- Various national cyber agencies

LIBOQS (OPEN QUANTUM SAFE)

WHO IS UTILIZING IT AND HOW FAMOUS?

Fame and Recognition
Statistics
- GitHub Stars : 1,800+ (Top PQC library)
- Downloads: 50,000+ monthly
- Citations: 200+ academic papers
- Integrations: 30+ projects using liboqs

Awards and Recognition
- Part of NIST PQC standardization efforts
- Featured in major security conferences - Recommended by industry standards bodies
- Widely cited in academic literature

TOOLS PRESENTATION

COMPARISON WITH SIMILAR TOOLS

vs. PQClean
- liboqs: More comprehensive, production-ready
- PQClean: Focus on clean, portable code
- Winner: liboqs for deployment, PQClean for reference

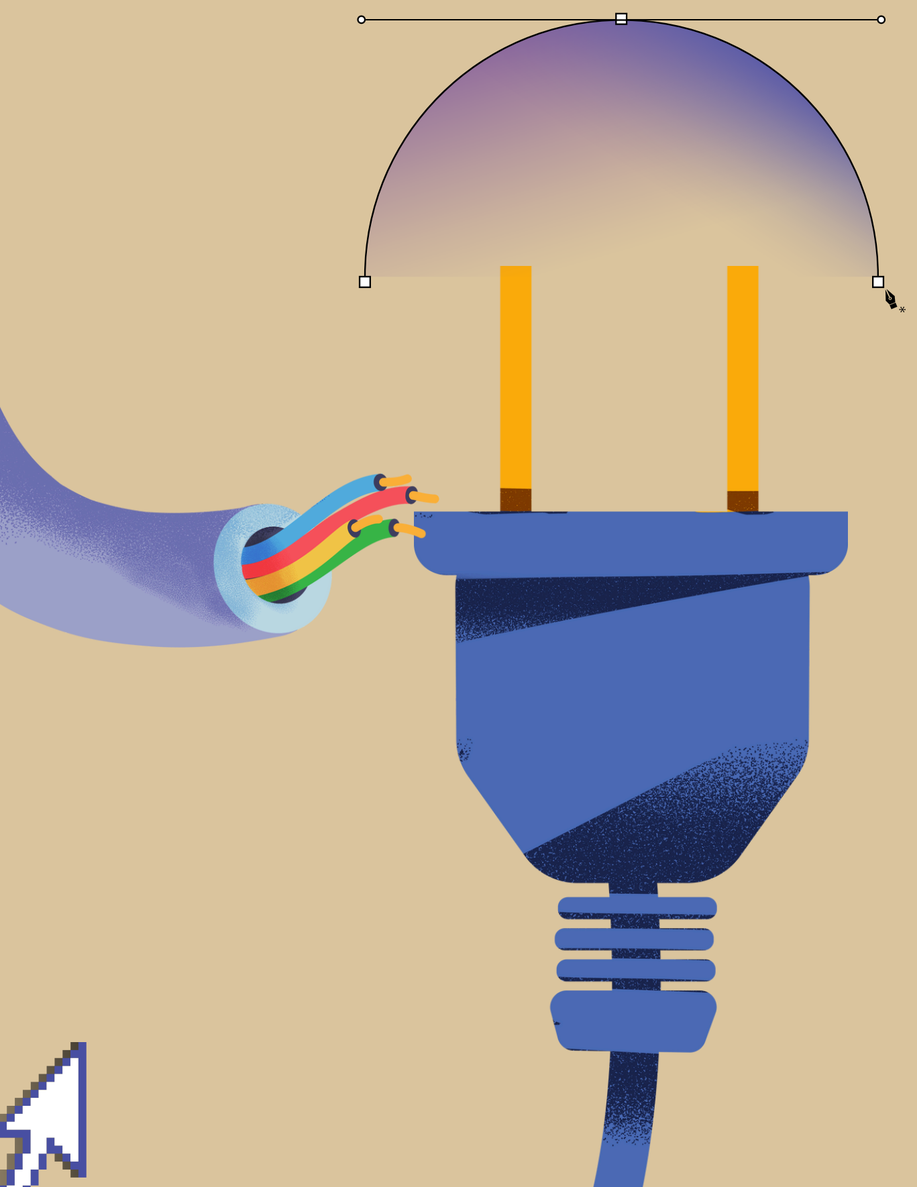
vs. Bouncy Castle PQC
- liboqs: C library, performance-focused
- Bouncy Castle: Java, easier integration
- Winner: Depends on language preference

vs. OpenSSL PQC Fork
– liboqs: Standalone, algorithm-focused
- OpenSSL:Full SSL/TLS stack
- Winner: liboqs for flexibility, OpenSSL for protocols

COMPARISON WITH SIMILAR TOOLS

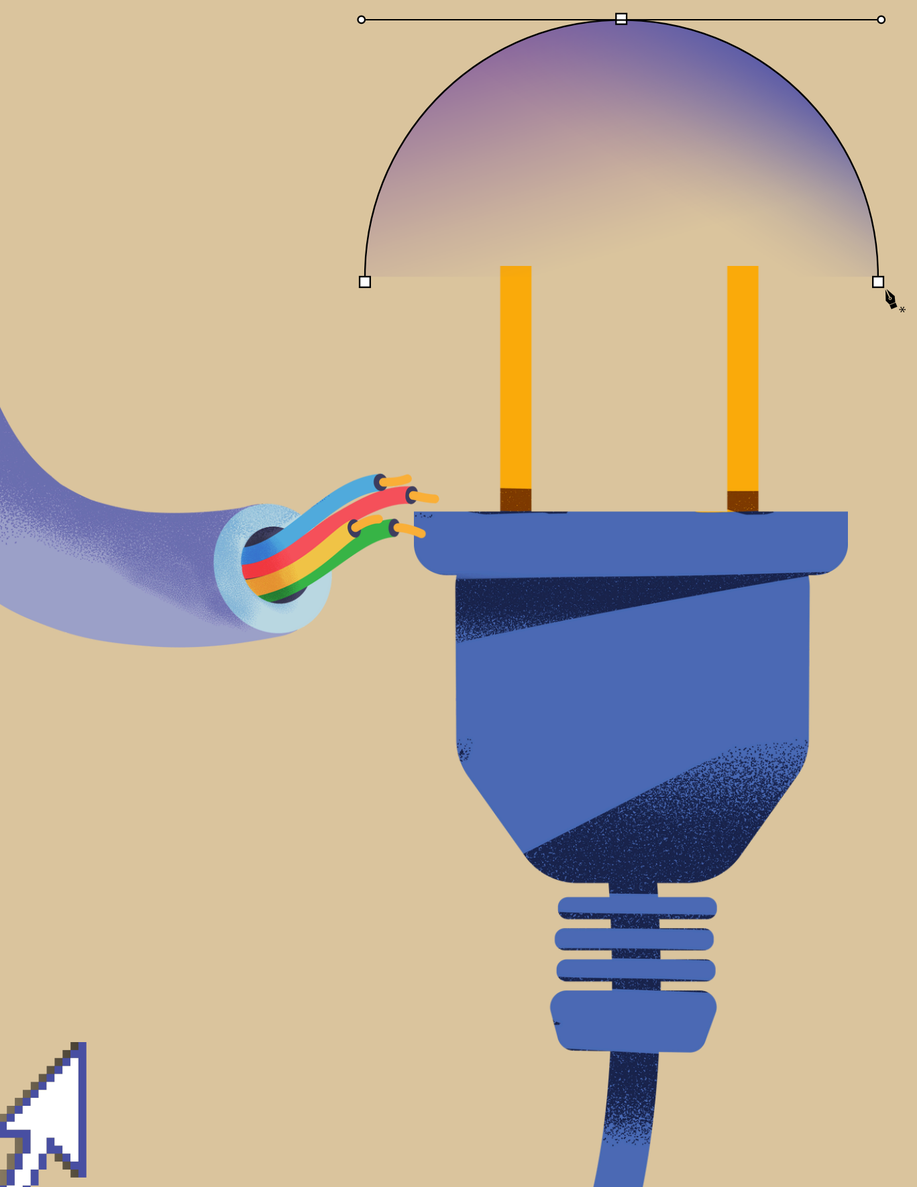
vs. libsodium
- liboqs: PQC-focused
- libsodium: Classical crypto, easy to use
- Winner: Different purposes (PQC vs classical)

Industry Adoption Level
Status: LEADING PQC LIBRARY
- Most widely deployed open-source PQC library
- Industry standard for PQC integration
- Active development and maintenance
- Strong community support



AVAILABLE ALGORITHMS

Key Encapsulation Mechanisms (KEMs)
- CRYSTALS-Kyber: Kyber512, Kyber768, Kyber1024
- BIKE: BIKE-L1, BIKE-L3, BIKE-L5
- Classic McEliece: Multiple parameter sets
- HQC: HQC-128, HQC-192, HQC-256
- NTRU: NTRU-HPS, NTRU-HRSS
- SABER: LightSaber, Saber, FireSaber



AVAILABLE ALGORITHMS

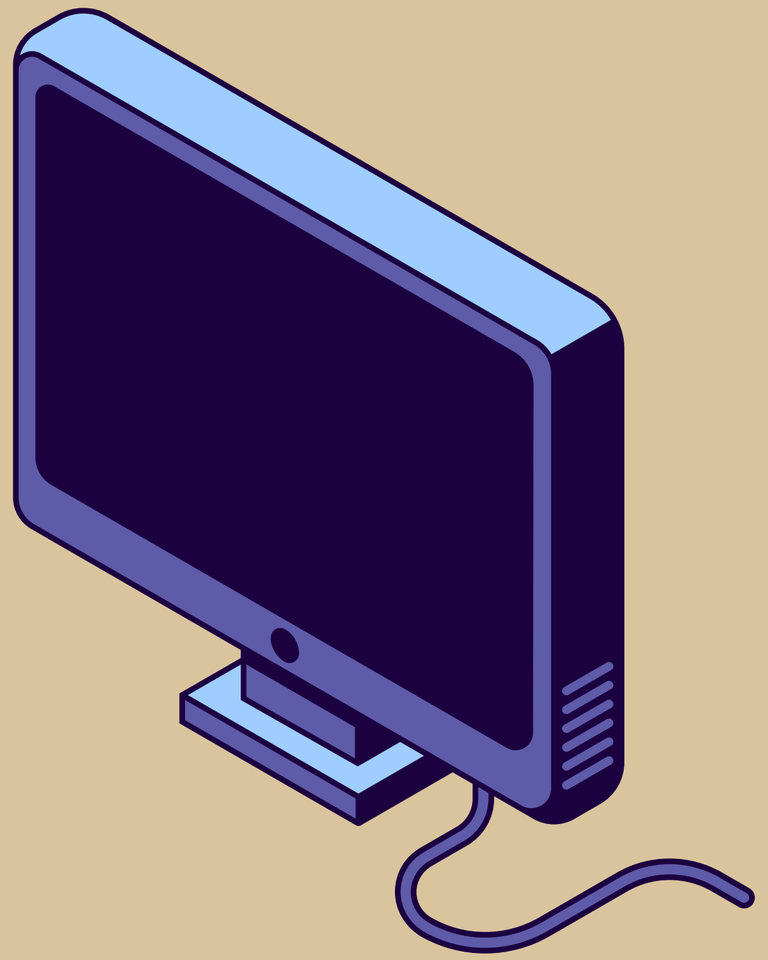
Digital Signatures

- CRYSTALS-Dilithium: Dilithium2, Dilithium3, Dilithium5
- Falcon: Falcon-512, Falcon-1024
- SPHINCS+: Multiple parameter sets
- Picnic: Various levels
- Rainbow: Multiple levels

LIBOQS (OPEN QUANTUM SAFE)

TOOLS: LIBOQS LIVE DEMONSTRATION

The link of Colab notebook:
https://colab.research.google.com/drive/1OGYULoYvtzcmPWfe7MaBbqfmCN6Mtl8A?usp=sharing



TOOLS PRESENTATION

RESOURCES

Official Links
- Website: https://openquantumsafe.org/
- GitHub: https://github.com/open-quantum-safe/liboqs
- Documentation: https://openquantumsafe.org/liboqs/
- Wiki: https://github.com/open-quantum-safe/liboqs/wiki

Tutorials
- Getting Started Guide
- API Reference (Doxygen)
- Integration Examples
- Performance Tuning

RESOURCES

Official Links
Community
- GitHub Discussions
- Stack Overflow
Related Projects
- oqs-openssl: OpenSSL with PQC
- oqs-openssh: SSH with PQC
- oqs-provider: OpenSSL 3.0 provider
- oqs-demos: Example applications

CONCLUSION

Summary
✓ liboqs is the leading open-source PQC library
✓ Easy to install and use (multiple platforms)
✓ Completely free and open source (MIT licence)
✓ Excellent community support (GitHub, Slack, mailing list)
✓ Widely used (industry, academia, government)
✓ Perfect for research (reproducibility, comprehensiveness, trusted)
✓ Production-ready (security audited, optimized, maintained)

THANK YOU!