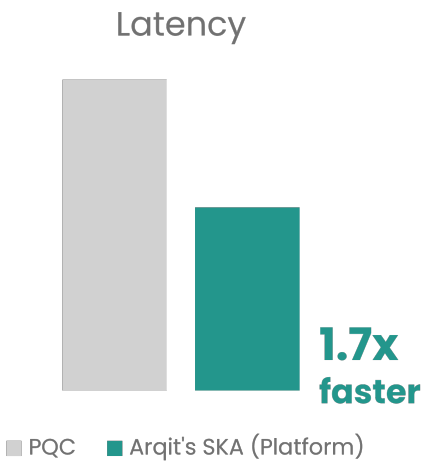
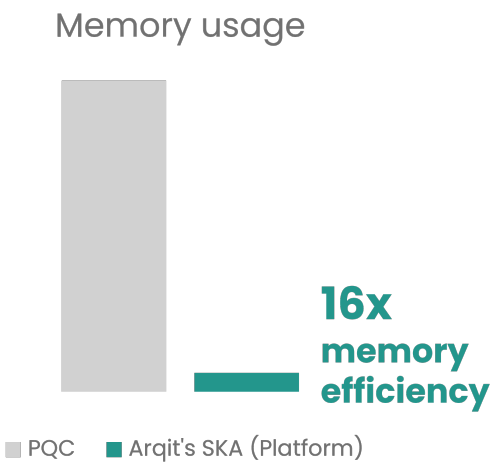
SKA (Platform)™ Outperforms ECC and PQC

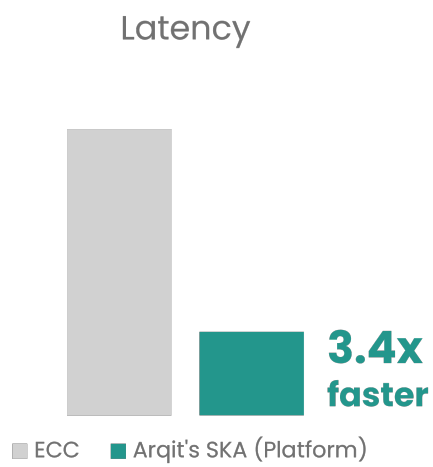
Arqit has established the performance benefits of our key agreement product through rigorous external testing. We found that measured latency and memory use of SKA (Platform); Arqit's symmetric key agreement platform, significantly outperformed equivalent key agreement mechanisms using Elliptic Curve Cryptography (ECC) and Post-Quantum Algorithms (PQAs).

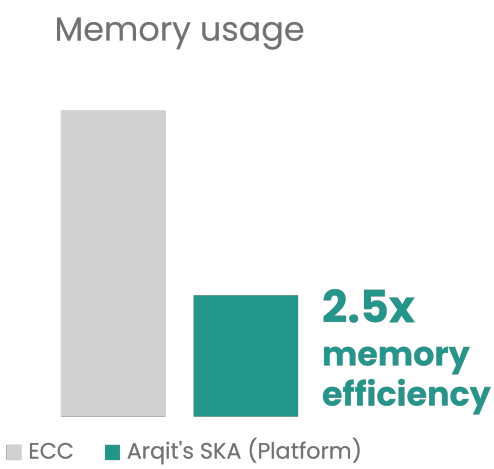
Comparison with PQC





Comparison with ECC





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Results

Key Exchange Algorithm	Latency (ms)	Memory use (kB)
Arqit's SKA (Platform)	84.33	8,737
CRYSTALS-Kyber	143.07	143,140
Elliptic curve Diffie-Hellman	288.84	22,032

Method

Arqit compared the latency (the total time taken) and memory use (RAM resources) used to complete full authentication and key agreement between an initiator device and a receiver device. For PQC we used a combination of CRYTALS-Dilithium-5 and CRYSTALS-Kyber-5 which are rated to have a security equivalent to AES-256 , similar to Arqit's SKA (Platform). For ECC we used secp256r1.

- Measurements were made on two unmodified Raspberry Pi 3b+ boards connected with an ethernet cable to reduce the impact of Wifi fluctuations.
- We used the open-source library 'mbed TLS' as a TLS implementation, together with libOQS as the PQC implementation.
- We compared our algorithm with a combination of digital signature and KEM methods that have been selected as finalists in the NIST PQC competition, namely CRYSTALS-Dilithium for signatures and CRYSTALS-Kyber for KEM.
- We chose the parameter set for these which achieve NIST's Security Level 5, which is comparable with AES-256 security as offered by Arqit's SKA (Platform).
- We compared key agreement using PQC with creating a "bilocation key" using Arqit's SKA (Platform), i.e. a key that requires communication with Arqit's SKA (Platform).

Conclusion

These results show that Arqit's SKA (Platform) is not only more secure than ECC and PQA but is also faster and uses fewer resources.

Numerical analysis of Arqit's SKA (Platform) with comparable post-quantum cryptography (PQC) methods for authentication and key agreement show that **Arqit's SKA (Platform) endpoints agree keys 1.7x faster and are 16x more memory efficient than PQC.**

In addition, similar analysis was performed which compared SKA (Platform) with Elliptic Curve Cryptography (ECC), the most widely used algorithms in use today in public and enterprise networks. As well as offering superior security, **Arqit's SKA (Platform) endpoints agree keys 3.4x faster and are 2.5x more memory efficient than ECC.**