ARQIT

Product Sheet

SKA (Platform)™

SKA (Platform); Arqit's symmetric key agreement platform creates quantum-safe, computationally secure symmetric encryption keys between endpoints, allowing them to exchange data with perfect quantum-safe security. SKA (Platform) integrates with proprietary or commercially available off-the-shelf solutions, applications, network infrastructure, and common network protocols like IPsec and TLS. It can either be consumed on a cloud-fulfilled Platform as a Service basis (SKA (PaaS)™), or deployed on-premise (SKA (PI)™).

Challenges

01	02	03	04
Quantum threat to data-in-transit	Time, skills and effort to migrate to most quantum-safe cryptography	Changing threat landscape with traditional security methods unable to adapt to modern requirements	Compliance with industry standards and regulations

Benefits

- Immediately hardens network communications and keeps data secure, preventing devastating SNDL attacks that carry significant financial, compliance, and reputational risk
- Simple, small-footprint overlay to existing infrastructure, avoiding rip-and-replace by integrating seamlessly with PKI and IPsec
- Scale the solution to any network-connected endpoint, e.g. virtual machines, data centers, IoT
- Benefit from the highest quality key material derived from high-quality entropy created from a quantum source (QRNG)
- Create new ephemeral symmetric encryption keys as often as required
- Minimal management overhead, with data easily exportable to existing SIEMs/XRD solutions
- Enables compliance with National Security Memorandum NSM-10 and NSA CSfC Symmetric Key Management Requirements Annex 2.1
- Conforms to NIST standards for cryptography e.g. AES-256, as well as NSA's recommended use of pre-shared keys to protect against the quantum threat
- Easy-to-use Arqit cloud console for advanced Adaptor configuration management e.g. endpoint logical grouping and endpoint policies
- Negligible performance and latency impact
- Enforce access control policies within the SKA (Platform) console

Features and functions

Quantum-safe communication between endpoint devices

Most forms of key exchange methods used in today's networks use mechanisms that are broken by quantum computers. While these specialist machines are not yet commercially available, it's possible for attackers to store data now and decrypt it later[1]. Arqit's key exchange protocol relies solely on methods which have been battle-tested for decades and are impervious to quantum attack, keeping your data-in-transit safe from attack.

Using SKA (Platform) any group of network-connected endpoints can agree quantum-safe encryption keys as often as required. These keys can be used on top of existing network security like Public Key Infrastructure (PKI) and interoperate with protocols like TLS and IPsec by combining the new symmetric key with existing encryption keys.

Our protocol was designed by some of the best minds from the cryptographic community and has been independently assured by The University of Surrey, a NCSC Centre of Excellence in Cybersecurity Research.

[1] SNDL attacks – Encrypted data is harvested today and stored by adversaries with the intent to decrypt it in the future when quantum computers reach sufficient maturity.

Strong, lightweight authentication and policy enforcement

It's important to ensure that only devices you trust can access your network. SKA (Platform) adopts a zero-trust approach where devices must always authenticate before using any of its services.

We use a strong form of authentication that's not vulnerable to attack by quantum computers and doesn't rely on public and private certificates that are difficult to manage and deploy at scale.

On top of authentication, SKA (Platform) enforces policies onto groups of devices, ensuring that only specified devices can talk to one another. When a device reaches the end of its lifecycle it can be easily decommissioned from within SKA (Platform) through its web console. Customers gain full control over their network, deciding which devices have access and, more importantly, which devices don't.

Widely deployable and scalable

SKA (Platform) technology can be deployed onto a wide variety of endpoints using SDKs written in several different languages. Here are some examples how SKA (Platform) can be deployed in your network.

- Between two data-centre firewalls (physical or virtual)
- Between a user device (e.g. a laptop) and a cloud service
- Among a group of IoT devices communicating with a base station

Endpoints require no specialist hardware – in fact, our protocol is so lightweight it uses fewer resources than both existing public-key cryptography and upcoming post-quantum algorithms, making it suitable for deployment on resource-constrained devices like IoT.

Capabilities in depth

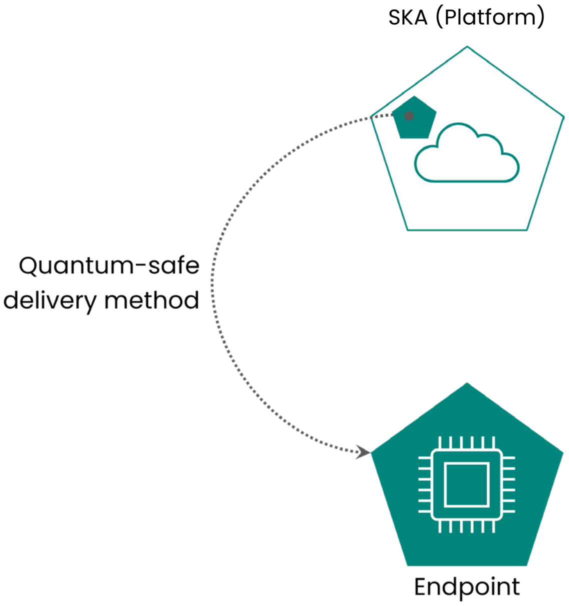
SKA (Platform) broadly provides four capabilities:

1. Secure registration and provisioning
2. Strong, forward-secret mutual authentication
3. Peer-to-peer session key agreement between endpoints
4. Device management and policy enforcement

These capabilities are delivered completely digitally and require only a lightweight software integration at the endpoint.

1. Registration and provisioning

All endpoints that use SKA (Platform) must be registered and provisioned, meaning they are known to SKA (Platform) and have been given the correct permissions to use its services.



Registration relies on the quantum-safe delivery of a root key, called the bootstrap key, to every device. There are several possible methods for safe bootstrap key delivery depending on the device and the environment. Delivery methods include both manual delivery of keys and over-the-air. Once the bootstrap key is installed a device registers with SKA (Platform) via a simple API call.

Figure 1: Provisioning. A bootstrap key is securely delivered from SKA (Platform) to the endpoint.

2. Authentication

Once an endpoint has its bootstrap key it can authenticate with SKA (Platform). We use a zero-trust approach that requires an endpoint to re-authenticate every time and whose permissions are validated in real-time. We use a strong, symmetric form of authentication that's quantum safe and provides forward secrecy with our novel ratcheting process that transforms the key every time an endpoint authenticates.

- Zero-trust model – no endpoint is assumed authentic and permissions are validated in real-time
- Authentication keys are ratcheted to ensure perfect forward secrecy
- Strong, mutual authentication based on a symmetric key using hash-based cryptography (HMAC)
- The authentication token is returned as a signed JWT which includes the endpoints claims

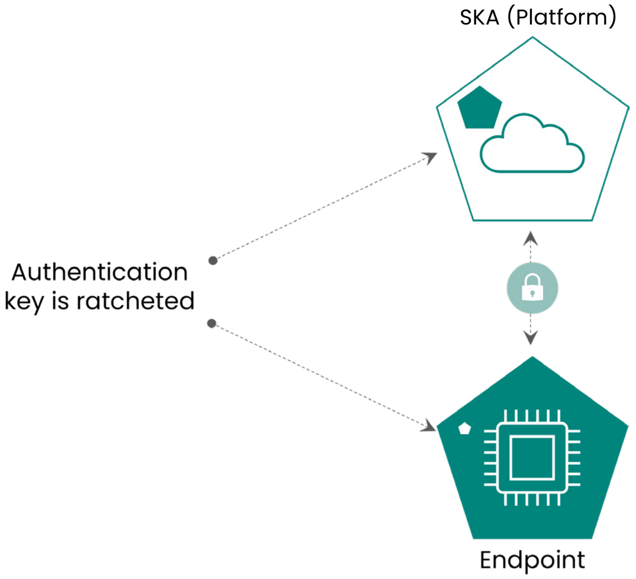


Figure 2: Authentication. The shared, symmetric key between SKA (Platform) and the endpoint is used for active, strong, mutual authentication. The authentication key is ratcheted each time the endpoint authenticates ensuring perfect forward secrecy.

3. Symmetric key agreement

When two or more devices want to create a symmetric key they first authenticate and establish a quantum-safe tunnel with the SKA (Platform) cloud service. Each endpoint then takes part in Arqit's protocol to receive high-quality key material (or entropy) from SKA (Platform) over the quantum-safe link. This key material is shared with other endpoints and is used to synthesise the final key in a way that isn't known to SKA (Platform), meaning the cloud service never knows or stores the final key.

This shared symmetric key can now be use in many ways to secure the data passing between endpoints, e.g. in an IPsec tunnel, or at the application level to encrypt data with AES.

- Quantum-safe key agreement using a novel protocol
- Removes the need for public-key cryptography, although can also easily be done in parallel
- Split-trust model ensures only the endpoints know the final shared key
- Key can be refreshed as often as required for the specific use case

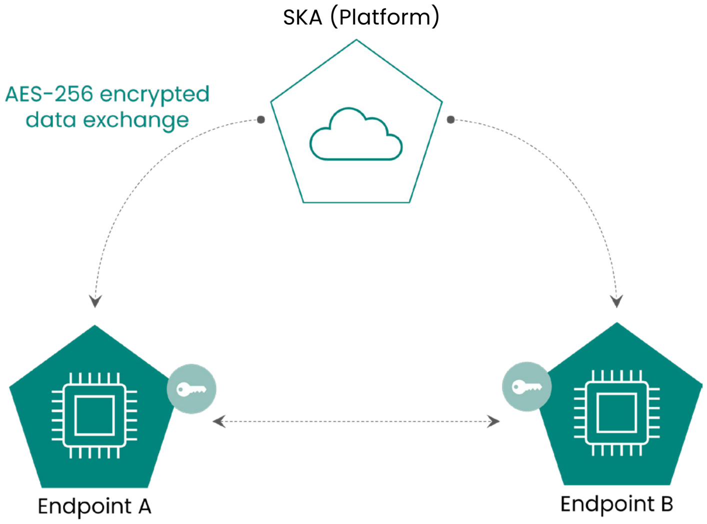


Figure 3: Key agreement. Endpoints receive identical high-quality entropy from SKA (Platform) and create a shared symmetric key using Arqit's proprietary key agreement protocol.

4. Device management and policy enforcement

SKA (Platform) offers system administrators tools to manage their network and control device access and permissions. Since every endpoint is authenticated with SKA (Platform), it's easy for administrators to quarantine devices or even fully revoke permissions. This active approach to authentication contrasts with traditional private certificates which are more passive and are notoriously difficult to revoke. Our approach works particularly well for closed, private enterprise networks where devices need to be both known and trusted to share data with each other.

Administrators can enforce these rules at either the endpoint level, or at a group level, making it easy to control large numbers of devices. Policies can influence all aspects of an endpoint's registration, provisioning, authentication, and key agreement with other endpoints.

- Control endpoint access and permissions using policies enforced by SKA (Platform)
- Group devices together to make management easier and apply policies consistently across devices

Implement commissioning processes so that endpoints are only onboarded after approval from designated personnel