

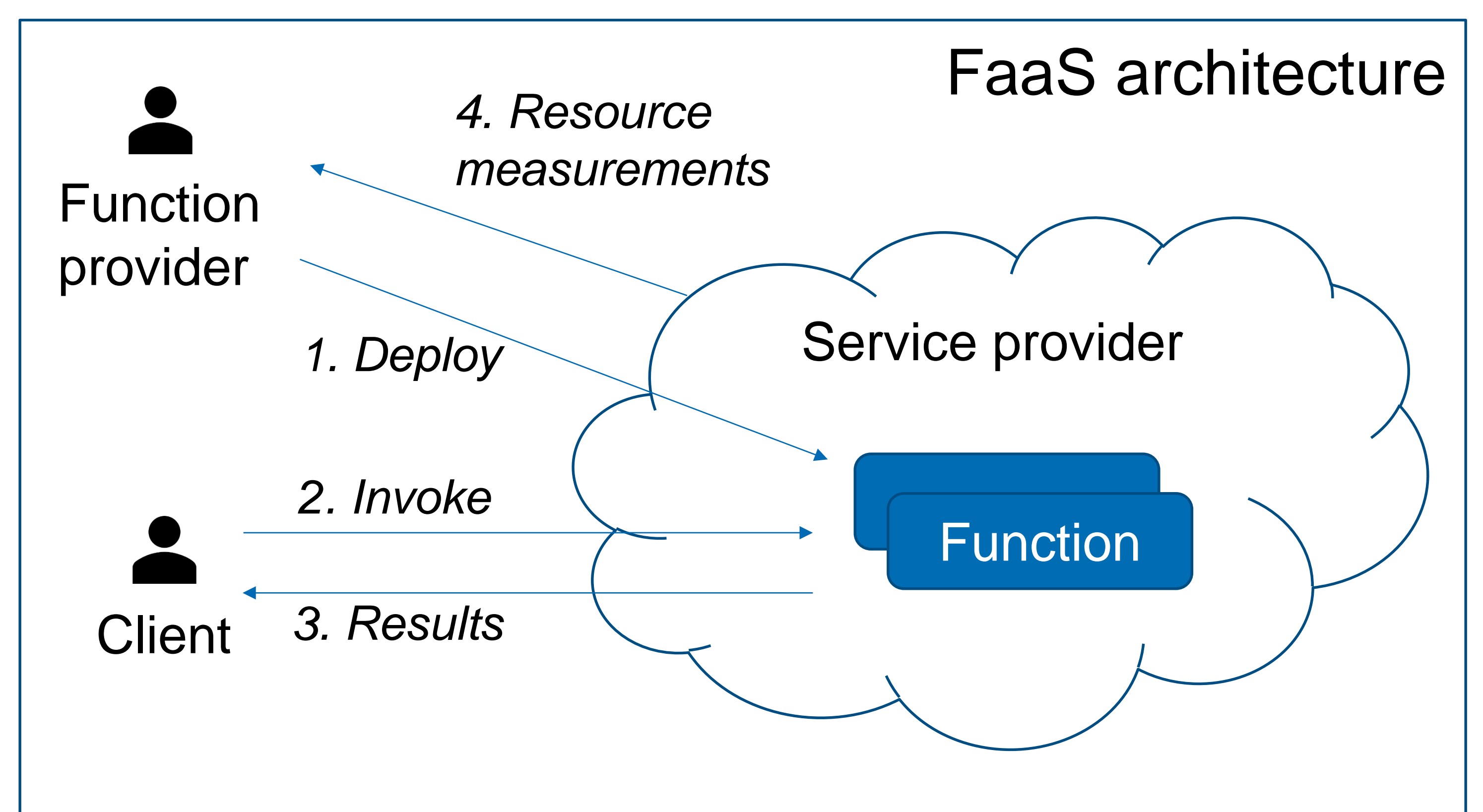


S-FaaS: Trustworthy and Accountable Function-as-a-Service using Intel SGX

- FaaS (Function-as-a-Service) executes *functions* on cloud provider managed infrastructure.
- Challenges: computation **integrity and confidentiality**, fine-grained **resource measurements** that are base for **accounting** and must not be tampered by **untrusted** cloud provider or function owner
- **Trusted Execution Environments (TEEs)** enable Secure Function-as-a-Service.

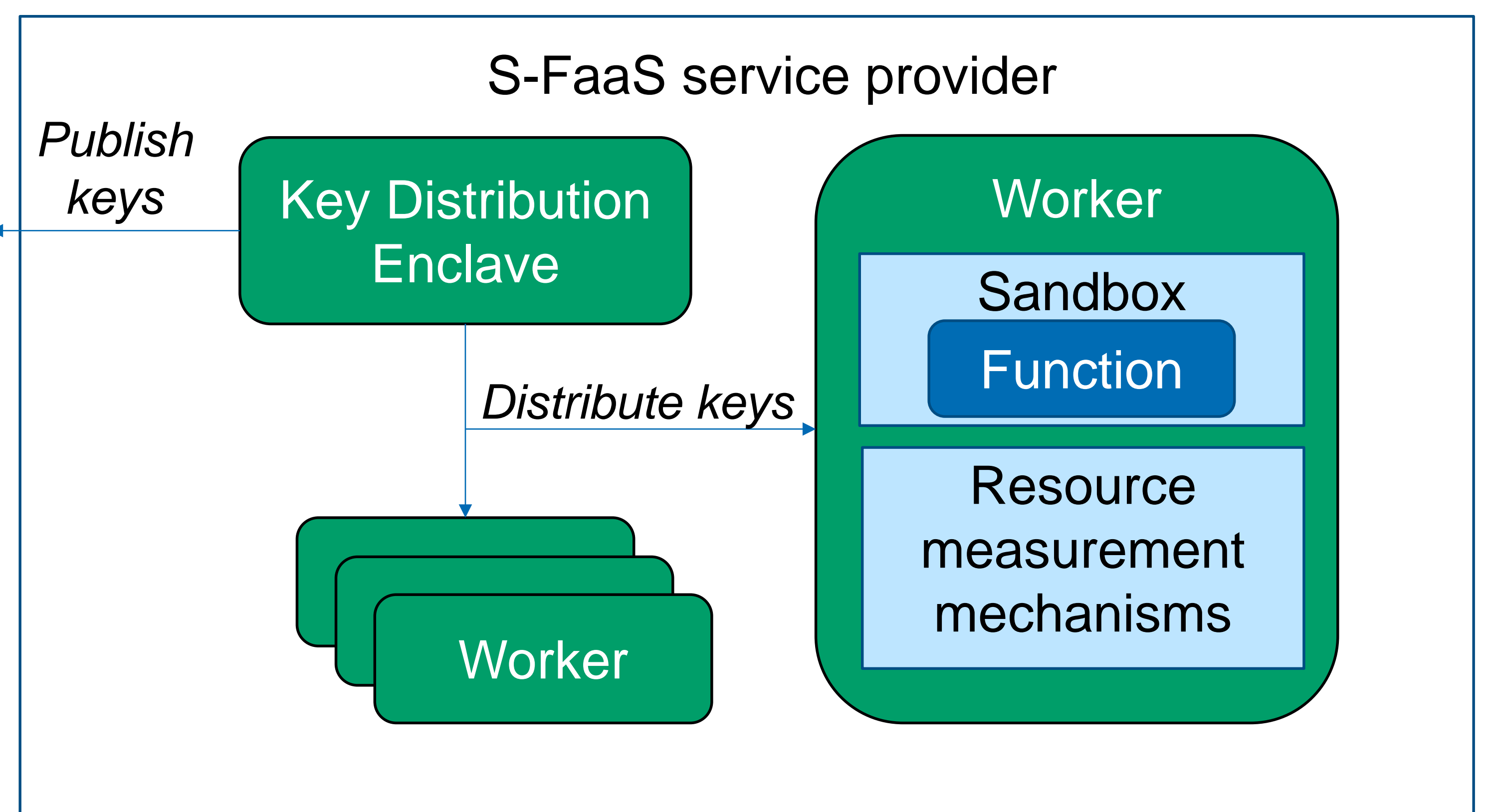
Design

- Key Distribution Enclave (KDE): **scalable** key management.
- Worker Enclaves: **isolated** function executors.
- Resource measurements: utilize Intel **TSX** (Transaction Synchronization Extensions).



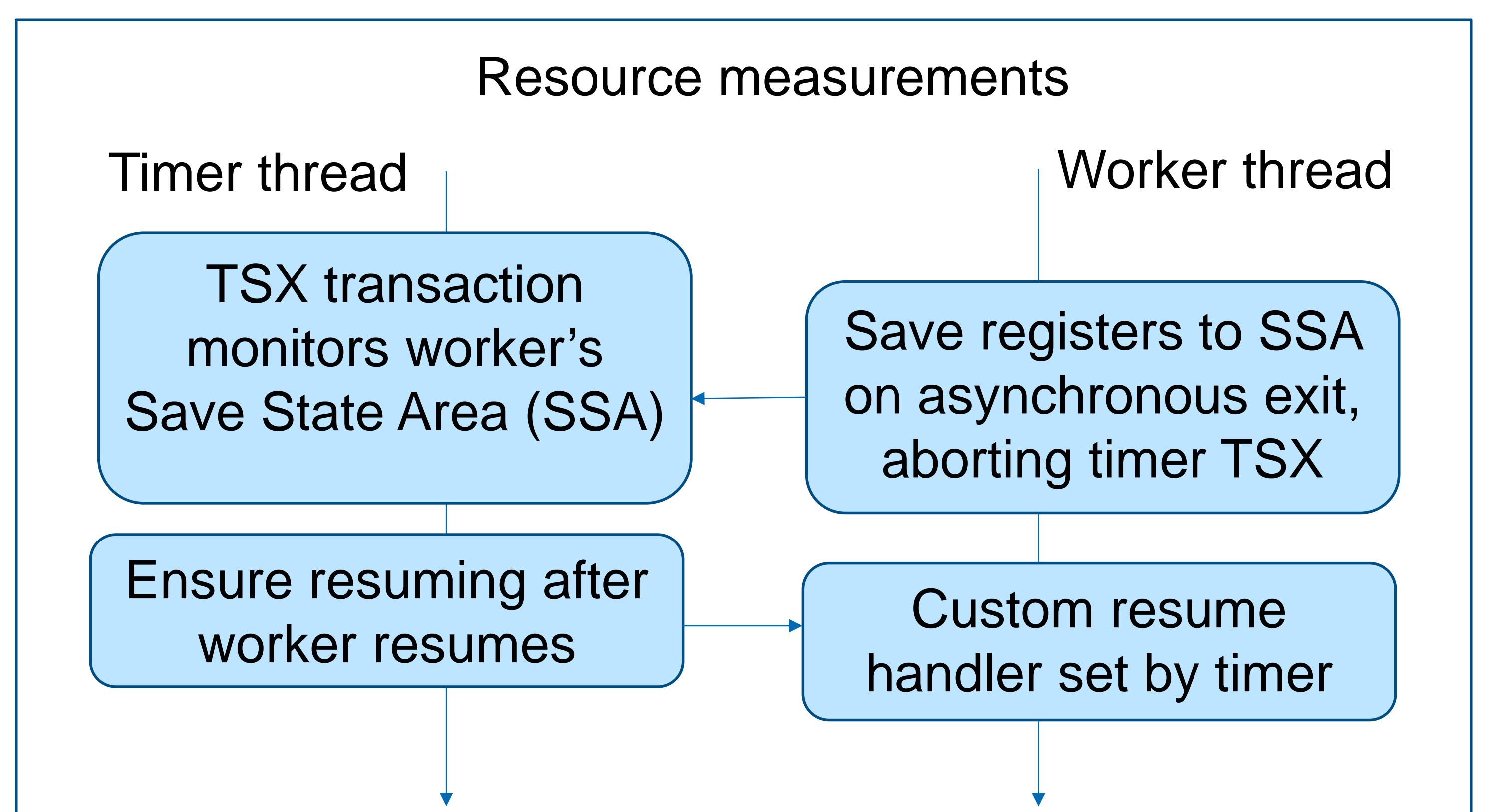
Main Features

- **Transitive** attestation: client attests KDE, verifies workers, KDE attests workers.
- **Encryption**: functions inputs and outputs.
- Results and resource measurements **signed**.
- **In-enclave isolation**: protecting resource measurement mechanisms.



Implementation

- Integration with Apache OpenWhisk.
- Duktape interpreter for Javascript functions.
- SGX SDK patch to support TSX-based resource measurements.



Evaluation

- **6.3%** maximum performance overhead.
- **Accurate** resource measurements.
- **Additional thread** but often **desirable**.

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