INTEL® SGX'S OPEN SOURCE APPROACH TO 3RD PARTY ATTESTATION

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Agenda

Intel® Software Guard Extensions (Intel® SGX)

Intel SGX Remote Attestation

Intel SGX Datacenter Attestation Primitives

Summary

Intel® Software Guard Extensions (Intel® SGX)

CPU instructions that enable the creation of memory regions (with security features) called ‘enclaves’

- Encrypted memory with strong access controls
- Updatable Trusted Computing Base (TCB)
- Hardware based attestation capability

Developers leverage the Intel SGX SDK and PSW to create application enclaves

- Relocate sensitive code and data to the enclave
- Per process Trusted Execution Environment (TEE)

Use Cases

- Key Protection, Crypto Module Isolation, Confidential Computing, etc.

Intel SGX Remote Attestation

Intel SGX Remote Attestation

- A demonstration that software has been properly instantiated on a platform
- Allows a Relying Party increased confidence that intended software is:
  - Running within an enclave
  - On a fully patched and updated Intel SGX enabled platform in good standing
- Occurs before provisioning secrets to application enclave

Attestation Evidence Conveys

- Identity of Software Being Attested
- Associated Report Data
- Details of unmeasured state (e.g., execution mode)

Intel SGX Remote Attestation: Two Approaches

Intel SGX Attestation Service

- Client platform focused
- Privacy Preserving and based on Enhanced Privacy ID (EPID) signatures
- Verification as a Service
- Provisioning and Attestation at workload runtime

Intel SGX Datacenter Attestation Primitives (Intel® SGX DCAP)

- Datacenter and Cloud Service Provider focused
- Flexible provisioning and based on ECDSA signatures
- ‘Primitives’ allow for construction of on-prem Attestation Services
- Leverages Flexible Launch Control available in new Intel SGX enabled platforms
- Opensource

Intel SGX Datacenter Attestation Primitives (Intel SGX DCAP)

Enables 3rd parties to build their own Intel SGX Attestation Infrastructure

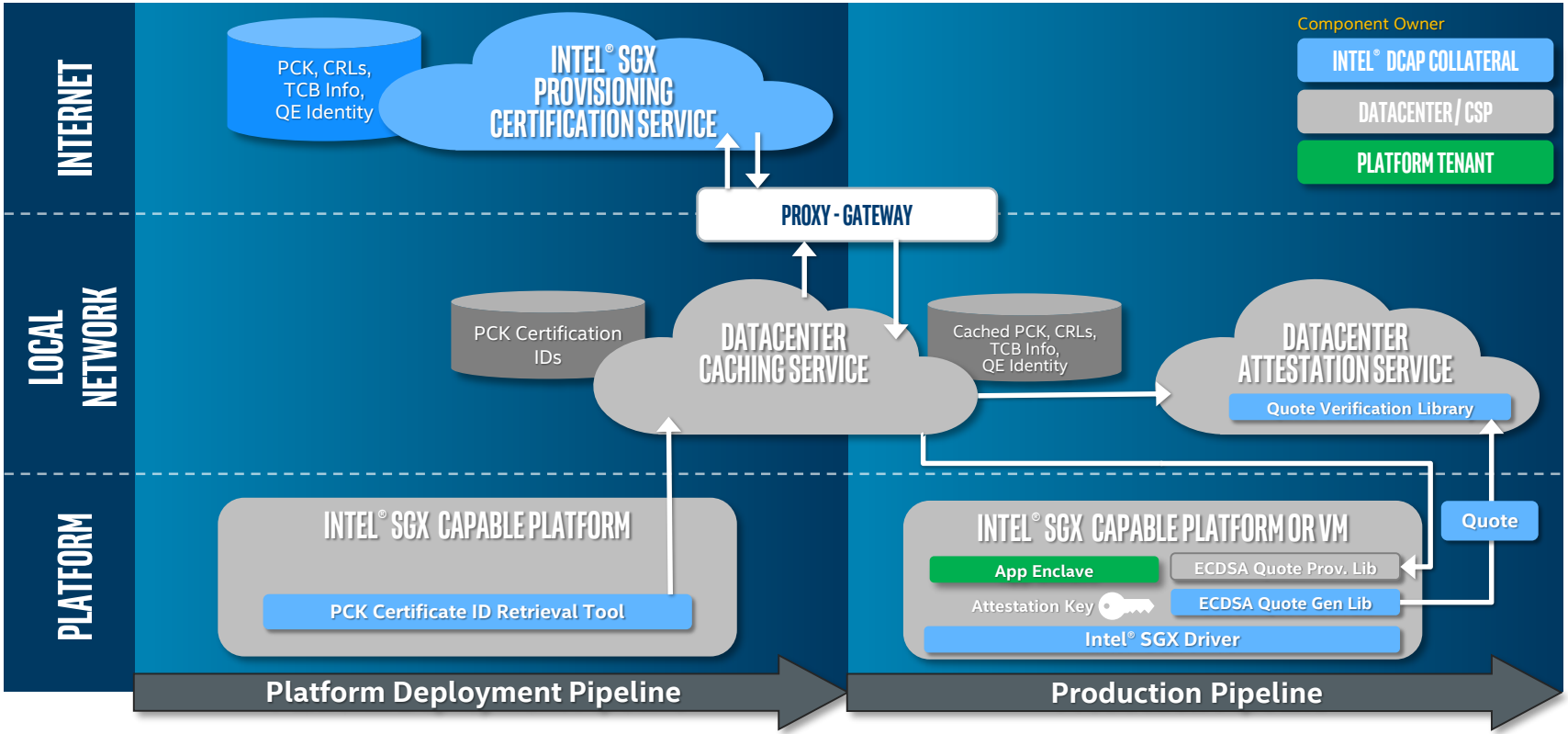
Ideal for :

- Environments where internet services are not accessible at workload runtime
- Entities who are risk-averse in outsourcing trust decisions to 3rd parties

Building blocks support three key attestation processes:

- Provisioning Certification Key and TCB Information Retrieval
- Quote Generation
- Quote and TCB Verification

High Level Architecture



Platform Certification Key (PCK) Retrieval

PCK Certificate

- Intel issues a PCK Certificate for each of its processors at various TCBs

PCK Certificate ID Retrieval Tool

- Extracts Platform Provisioning ID info for Intel PCS service request

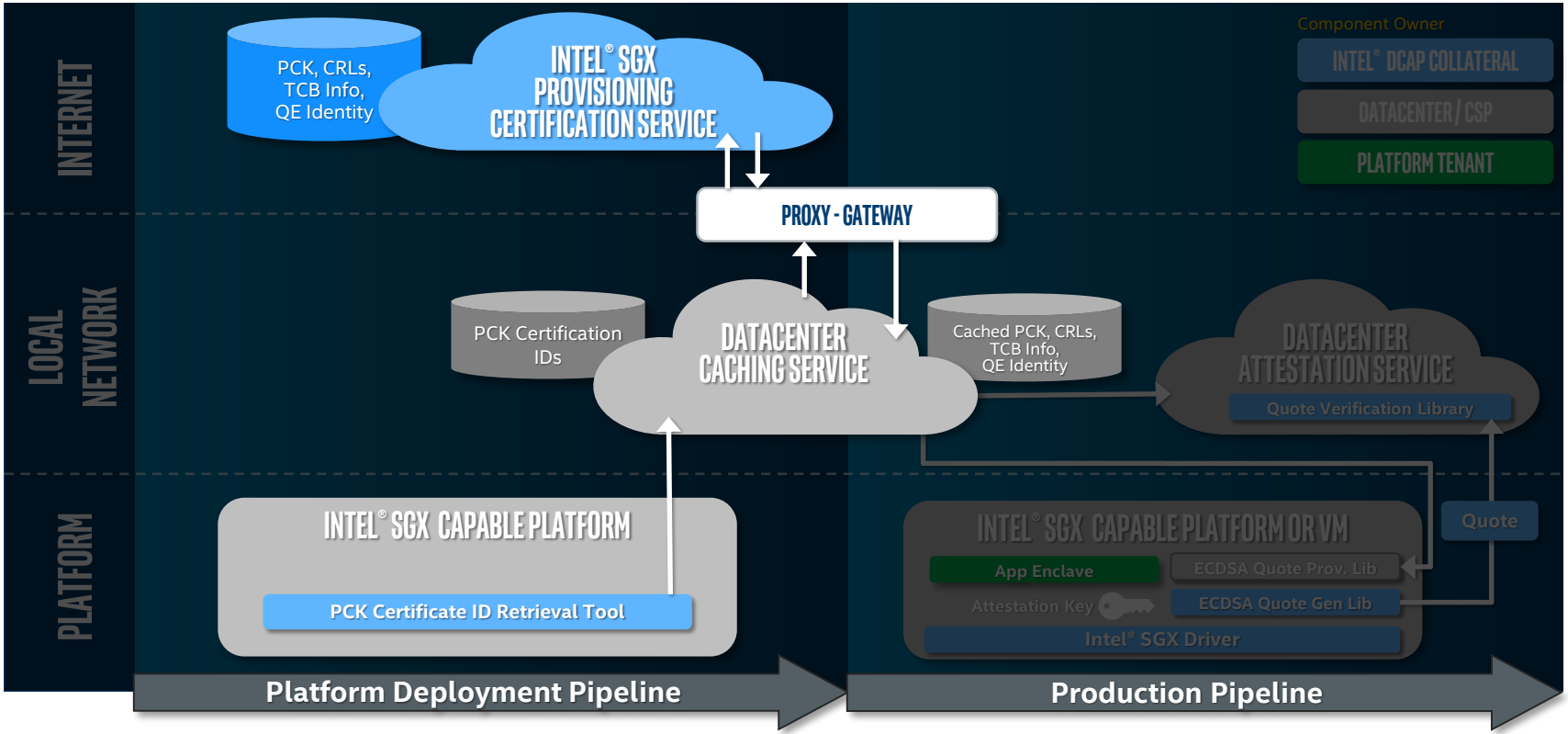
Intel Provisioning Certification Service (Intel PCS)

- Provisioning Certification Key (PCK) Certificate retrieval
- Intel SGX specific TCB information for a given processor type

PCK Caching Service

- Caches all PCK Certificates and associated TCB Info for each Intel SGX enabled platform in the datacenter
- Local to the datacenter for quick access

Platform Certification Key (PCK) Retrieval

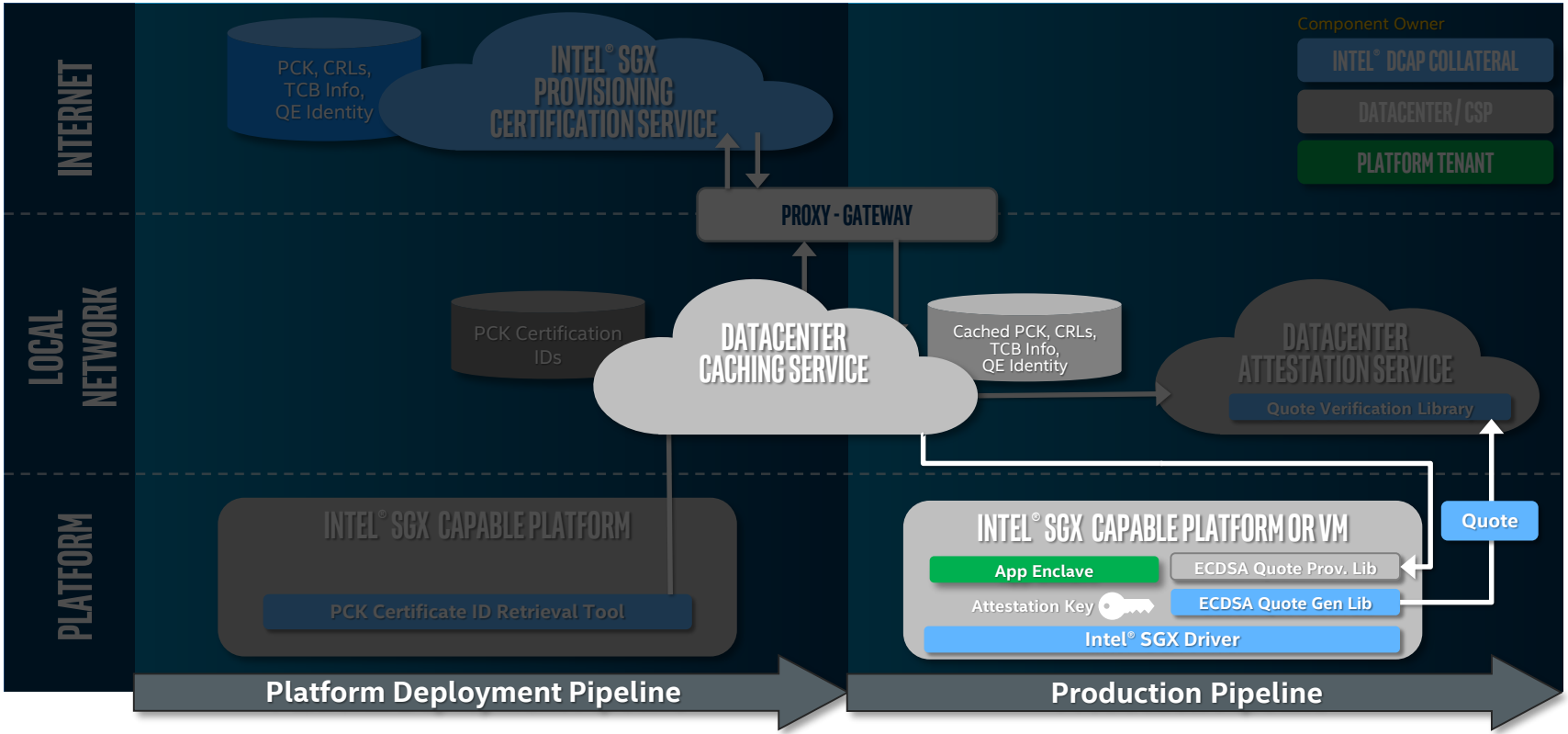


Quote Generation

Quote Generation Library

- API for generating attestation evidence for an Intel SGX based enclave
- Platform Certification Enclave
  - Local Certificate Authority for Quoting Enclaves (QE)
  - Provides some verification and then Certifies QE Attestation Keys
  - Signing key generated by SGX hardware specific to the TCB level associated with the PCK Certificate for the platform
- Quoting Enclave
  - Verifies and then signs the application enclave report resulting in a Quote

Quote Generation

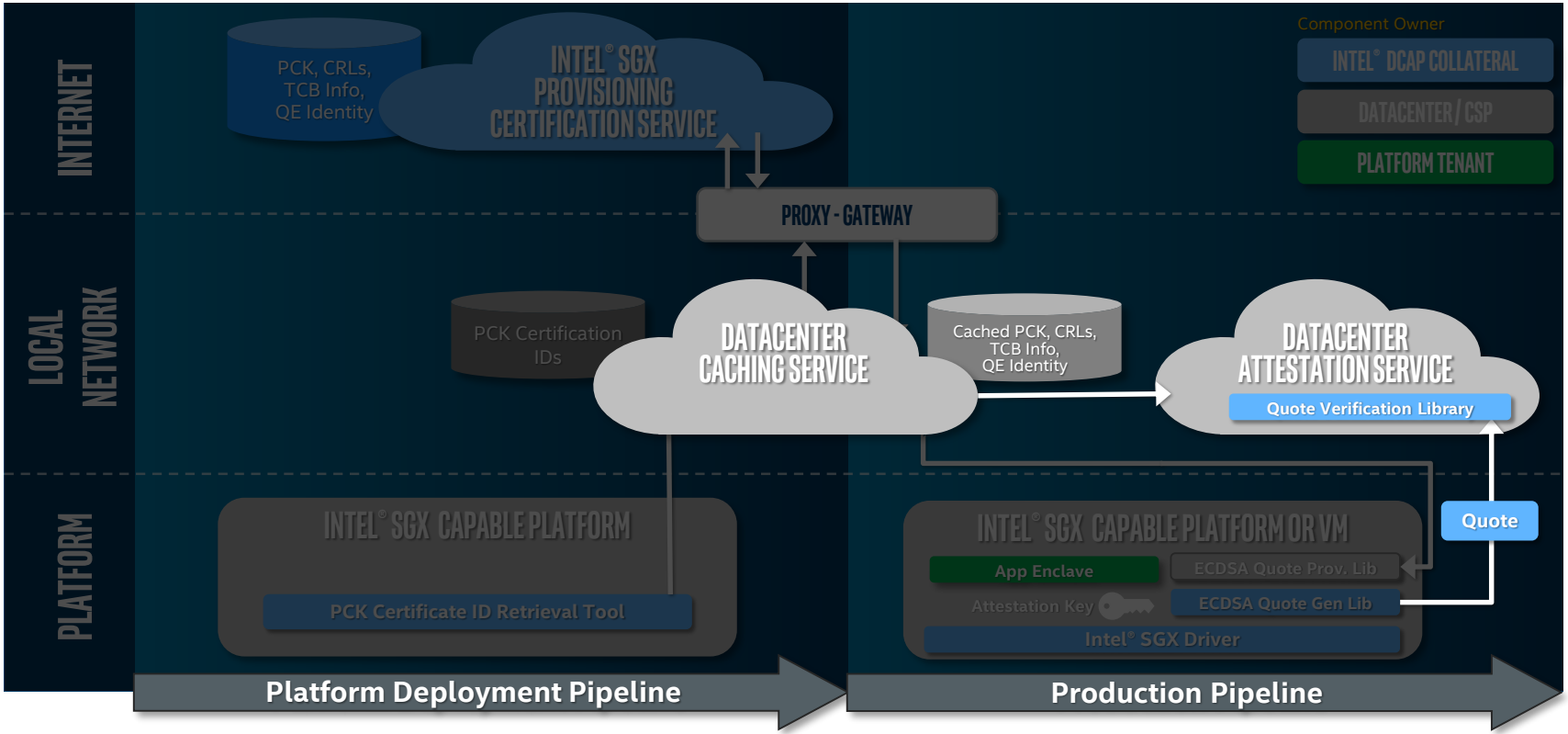


Quote & TCB Verification

Quote Verification Library (QVL) provides some validation as to:

- PCK Cert
- Platform TCB Info
- Quoting Enclave Identity
- ECDSA Verification of Quote
  - Determines if Relying Party should have more trust in the enclave being attested
- Note: App Enclave Identity verification is performed by the service providing some verification services (Attestation Service) and not the QVL itself

Quote & TCB Verification



Summary

Why is Intel SGX Remote Attestation Important?

- A successful attestation provides increased confidence to Relying Parties prior to deploying secrets to application enclaves
- And, allows for policy-based decisions based on Quote verification outcomes

Intel SGX DCAP allows 3rd parties to create their own Intel SGX Attestation Infrastructure for the Datacenter and Cloud

- Flexibility
- On-Prem Trust Decision
- SLA Ownership
- Opensource

More Information

Intel DCAP v1.1

- https://01.org/intel-softwareguard-extensions/downloads/intel-sgx-dcap-linux-1.1-release

Intel Provisioning Certification Service

- https://api.portal.trustedservices.intel.com/provisioning-certification

Source Code

- https://github.com/intel/SGXDataCenterAttestationPrimitives

Intel SGX Landing Zone

- https://software.intel.com/sgx

Slides Shared in Future Blog Post

- **https://intel.ly/2JflA2O**

QUESTIONS, COMMENTS?

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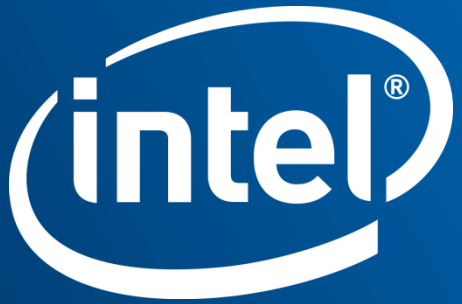
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