



EQUINIX

Solution Brief

Database Encryption

# DATABASE ENCRYPTION: SIMPLIFIED KEY MANAGEMENT ACROSS GLOBAL DATABASES

Equinix SmartKey® is a global SaaS-based secure key management and cryptography service offered on cloud-neutral Platform Equinix®, simplifying data protection and key management across any database architecture.

## Key Management for Data Privacy

The demand for encrypting data stored within databases keeps increasing, driven primarily by cybersecurity risks and regulatory compliance. Databases contain some of the most sensitive data assets of an organization, making them attractive targets to attackers and bad actors.

As a result, the data stored within databases should be encrypted at all times, yet securely accessible upon demand. However, when the volume of data and distribution grows, and varied use cases and applications that need to access that data multiply, existing and legacy database encryption solutions fail for a variety of reasons:

1. Performance limitations.
2. Inability to scale well and adapt to clustered databases or geographically distributed data stores.
3. Require a combination of disparate standalone solutions, further complicating the challenge, as typically more than one solution is required (e.g., TDE and tokenization).

As a result, the lack of adequate scalable solutions—as well as their complexity—leads to a situation where encryption keys are sometimes stored in the databases themselves, creating a clear security risk.

“Security policies must be coordinated across all data silos, and enterprise key management (EKM) should be implemented. Database administrators (DBAs) should not have management responsibility for encryption, but EKM will provide consistent security policies across the different Relational Database Management System platforms.”

Gartner, Hype Cycle for Data Management, 2019



## Databases and the Role of Hardware Security Modules (HSMs)

Major database and storage vendors are well aware of the security risk associated with storing encryption keys in the databases themselves. To mitigate this risk, vendors have integrated application programming interfaces (APIs) for encryption key management, allowing the keys to be generated and stored in a non-exportable manner within Hardware Security Modules (HSMs).

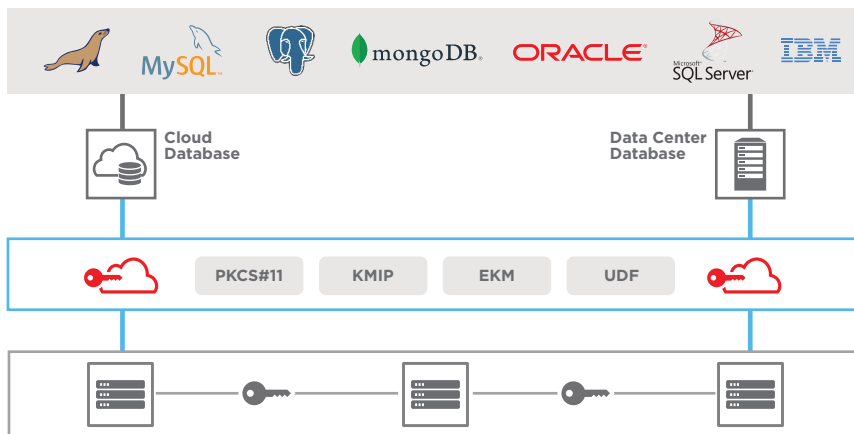
HSMs are hardware appliances, designed and certified to be tamper-evident, intrusion-resistant and provide the highest level of physical security. Encryption keys are stored in the HSM, while cryptographic operations are securely executed within the module.

Although traditional HSMs work fine in lab environments, organizations have several concerns with utilizing them in real-world deployments. For example, databases are typically large and may need to manage a large volume of keys while having a high transactions per second (TPS) requirement. Database installations may also be spread out geographically and require low latency at multiple locations.

Traditional HSMs can struggle to handle many of these requirements in an effective manner. Additionally, traditional HSMs don't cluster very well or rely on a client for load balancing which becomes a bottleneck and security vulnerability.

## Benefits

- **Broad Database Support**  
Compatible with Oracle, SQL Server, MongoDB, PostgreSQL, MySQL, MariaDB, IBM Db2.
- **Scalable Performance**  
Linear scalability through multi-site clustering to meet any performance need.
- **Public Cloud and On-Premises**  
A single solution supports both public cloud and on-premises databases, and with high availability and built-in disaster recovery.





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## Solution: Equinix SmartKey

A scalable, globally available, hardware-backed, cloud-native data security platform, Equinix SmartKey provides integrated key management and cryptographic services via a high-performance architecture, equipped to handle the high transaction rates that large commercial databases demand.

With the ability to replicate keys across geographically distributed sites with minimal latency and high consistency, Equinix SmartKey is designed to be infinitely scalable, highly available and resilient to disasters and faults.

SmartKey is available as a FIPS 140-2 Level-3 validated service. Applications can integrate with SmartKey through extensive, standards-based interfaces such as PKCS#11, KMIP and REST. Applications and users can also interface with SmartKey via an intuitive web-based user interface and powerful APIs.

## SmartKey: Providing Data Encryption Multiple Ways

Data encryption within databases refers to a number of encryption methods applied to data stored across an enterprise environment's IT stack.

Three broad categories describe data encryption at different levels or layers where the encryption is performed, and where the keys and data are stored:

- Transparent Data Encryption (TDE).
- Application-level encryption.
- Storage encryption (i.e., data warehouses and data lakes, unstructured data).

SmartKey delivers all three encryption methods in one centrally managed service. No specific use case clients (e.g., file encryption, TDE, application encryption) are required. SmartKey removes the OS and application dependency and complexity by using APIs and standard cryptographic interfaces.

For example, in a typical TDE architecture, a master encryption key would be generated, stored and retrieved from SmartKey, while the intermediate, or table[space] keys may be generated, stored in, managed and retrieved from the local database implementation. Managing the master encryption key is done outside the database and is accessible only to a user granted the appropriate privileges. By storing the master key in SmartKey, it can be utilized across different database implementations, data centers and cloud environments.

## About Equinix

Equinix is the world's digital infrastructure company. Digital leaders harness our trusted platform to bring together and interconnect the foundational infrastructure that powers their success. We enable our customers to access all the right places, partners and possibilities they need to accelerate advantage. With Equinix, they can scale with agility, speed the launch of digital services, deliver world-class experiences and multiply their value.

Learn more at [Equinix.com](https://Equinix.com)

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