Protecting Data and Transactions with Encryption and Tokenization

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What We'll Cover

- Encryption and Tokenization for the financial services data center.
- How the technologies work.
- How to pick the right one for your project.

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Access Controls

Encryption

DRM

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The Three Laws of Encryption

If Data Moves Physically or Virtually

For Separation of Duties

Mandated Encryption

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Where to Encrypt

Separation of Duties	Movement/Media Protection
• Database Fields • Workstation File/Folder • Server • NAS • Applications	• Tape • SAN • Laptops/FDE • Email • Portable Media

Encryption Options

File/Folder

Application/
Database

Media

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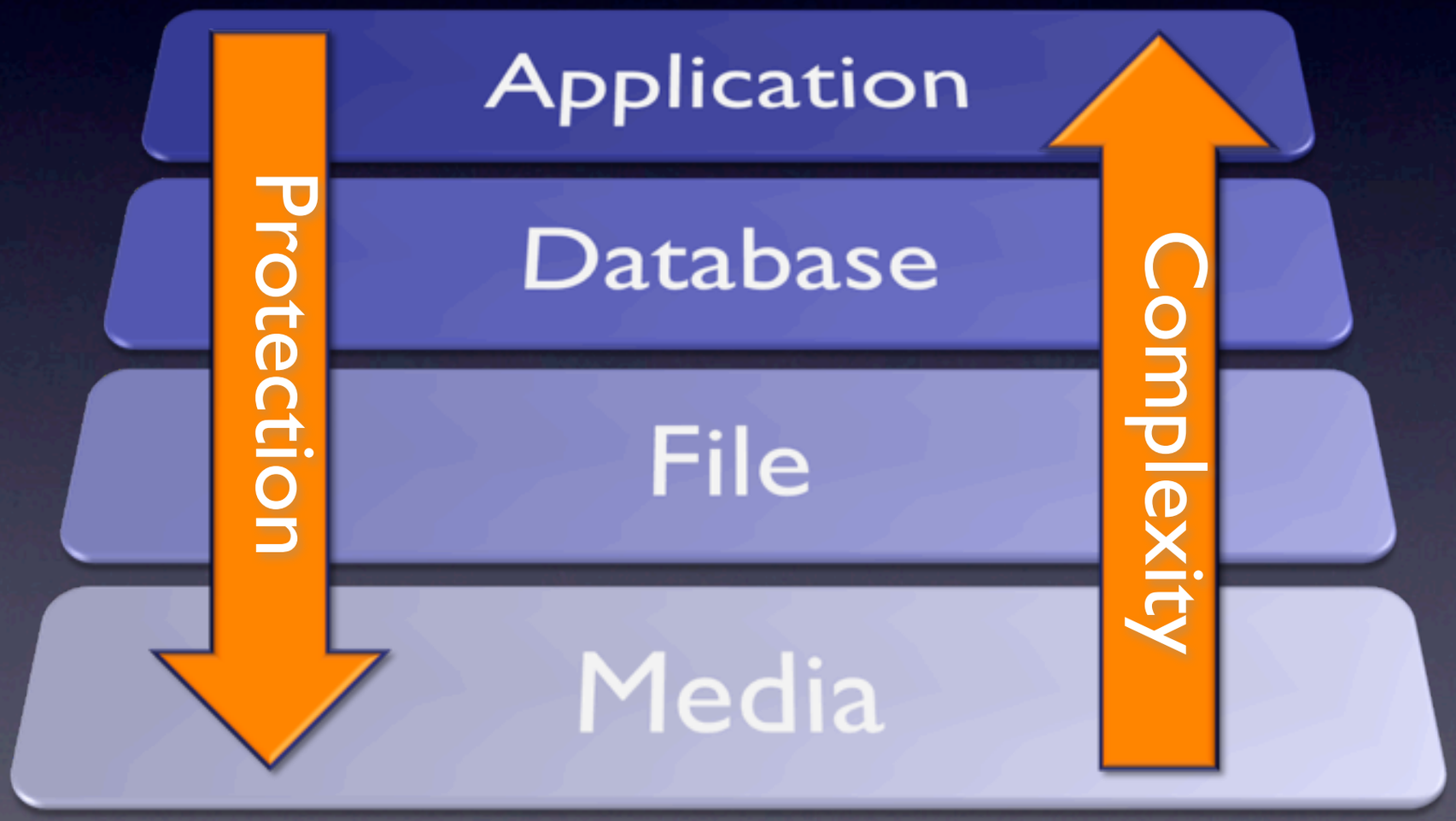
Encryption Layers



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Location

Management

Operations

Key

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Rules for Application Encryption

- Use toolkits.
- Use external key management.
- Rely on experts.
- Keep it simple.
- Keep it narrow.
- Have an expert evaluate it.

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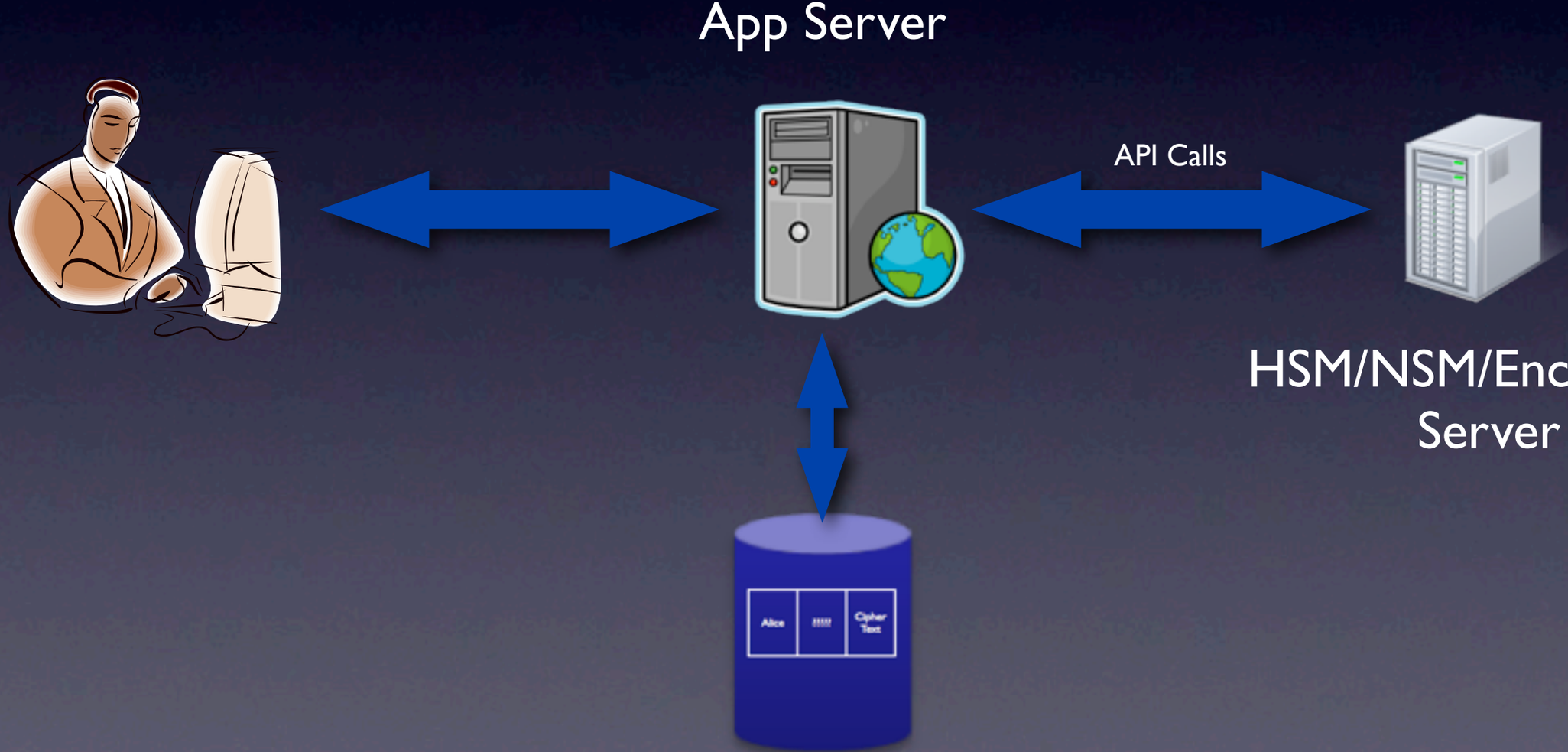
Application Encryption Architecture



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Application Level Encryption

- Granular application of encryption
- Completely external or App/DB hybrid
- Protects data from ad-hoc queries
- Protects data on media
- Keys (potentially) secure from IT and DBAs
- Keys (potentially) not tied to credentials
- Very expensive to retrofit applications/databases

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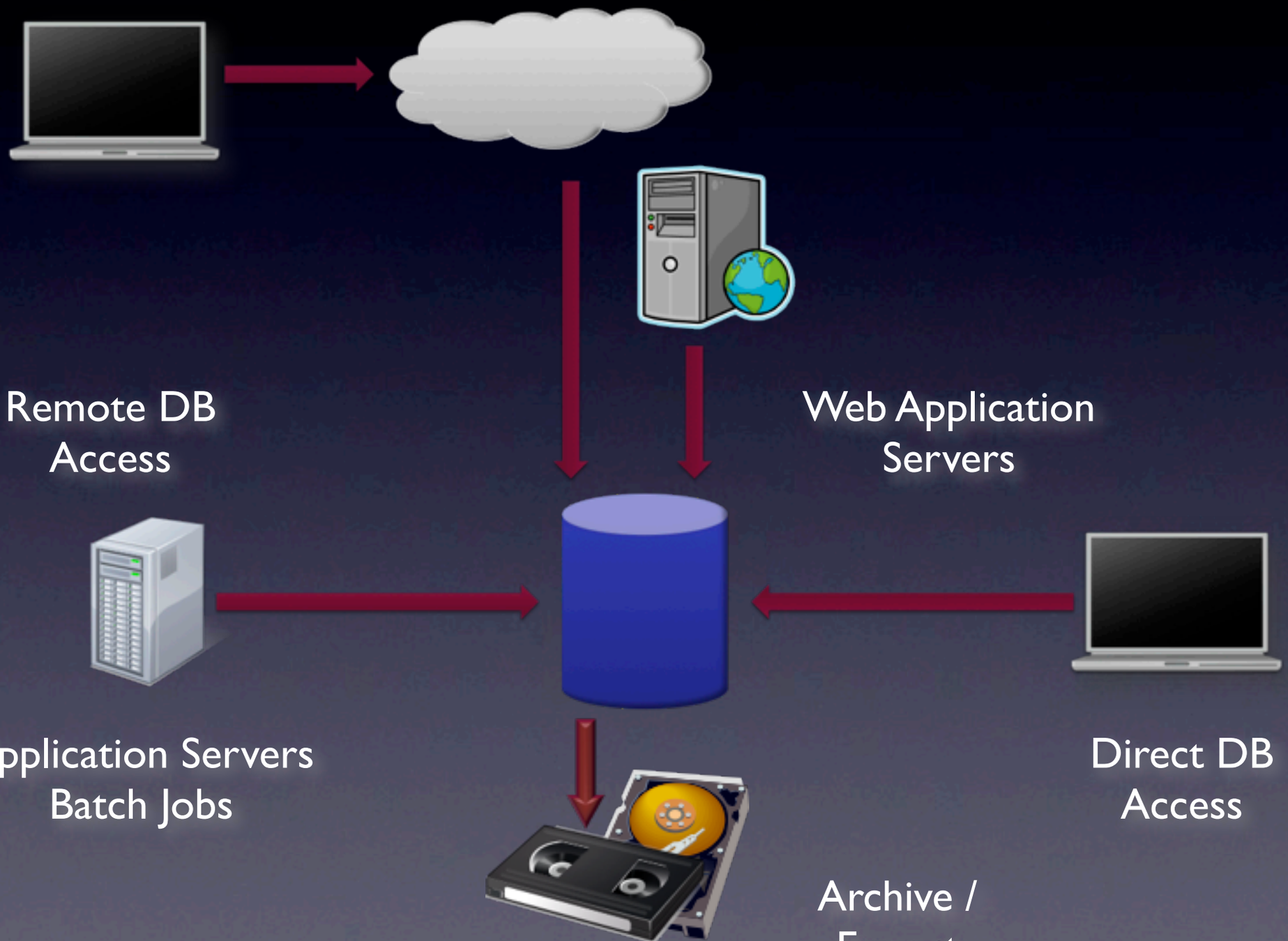
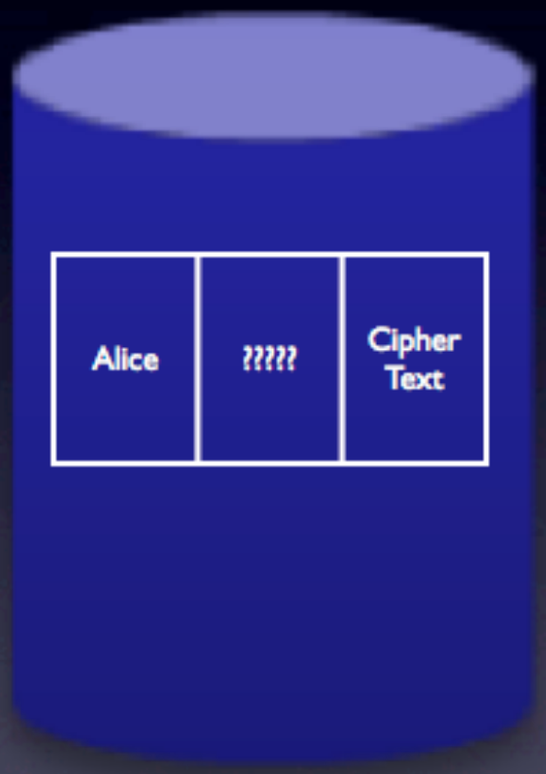
Database <> Not Data at Rest



Database Encryption Options

- Inside the Database
  - User/Object
  - Transparent
- Outside the Database
  - Application
  - OS/File
  - Media

Database Object Encryption



- Tablespace
- Table
- Column
- Row

Database Object Encryption

- Granular application of encryption
- Embeddable within queries/procedures
- Protects data from ad-hoc queries
- Protects media
- Keys secure from IT personnel
- Expensive to retrofit existing databases

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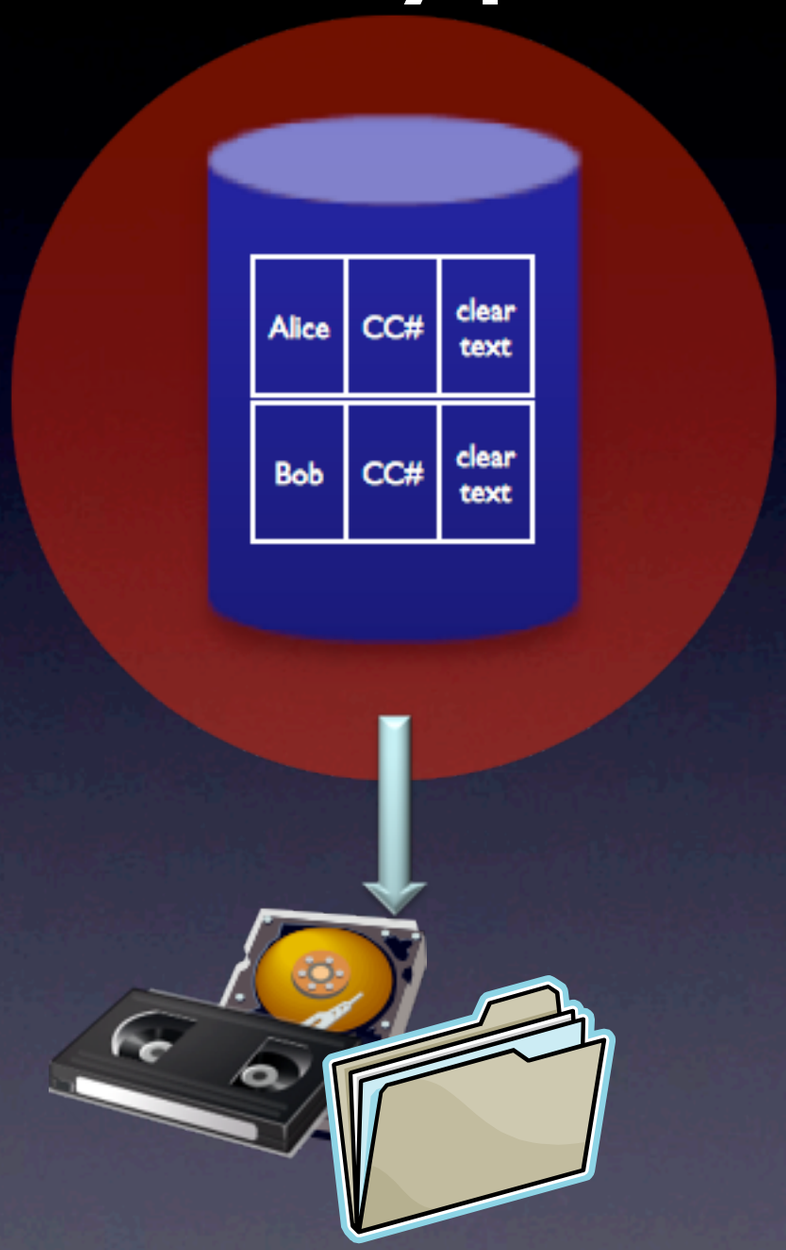
Transparent Database Encryption

Transparent Tablespace

Data Writer

Log Writer



Transparent Column

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Transparent Database Encryption

- Options for DB, schema, tables and columns
- Protects data on media
- No disruption to IT operations
- No modifications to application or database
- Keys secure from IT; options for HSM
- Incredibly easy to implement

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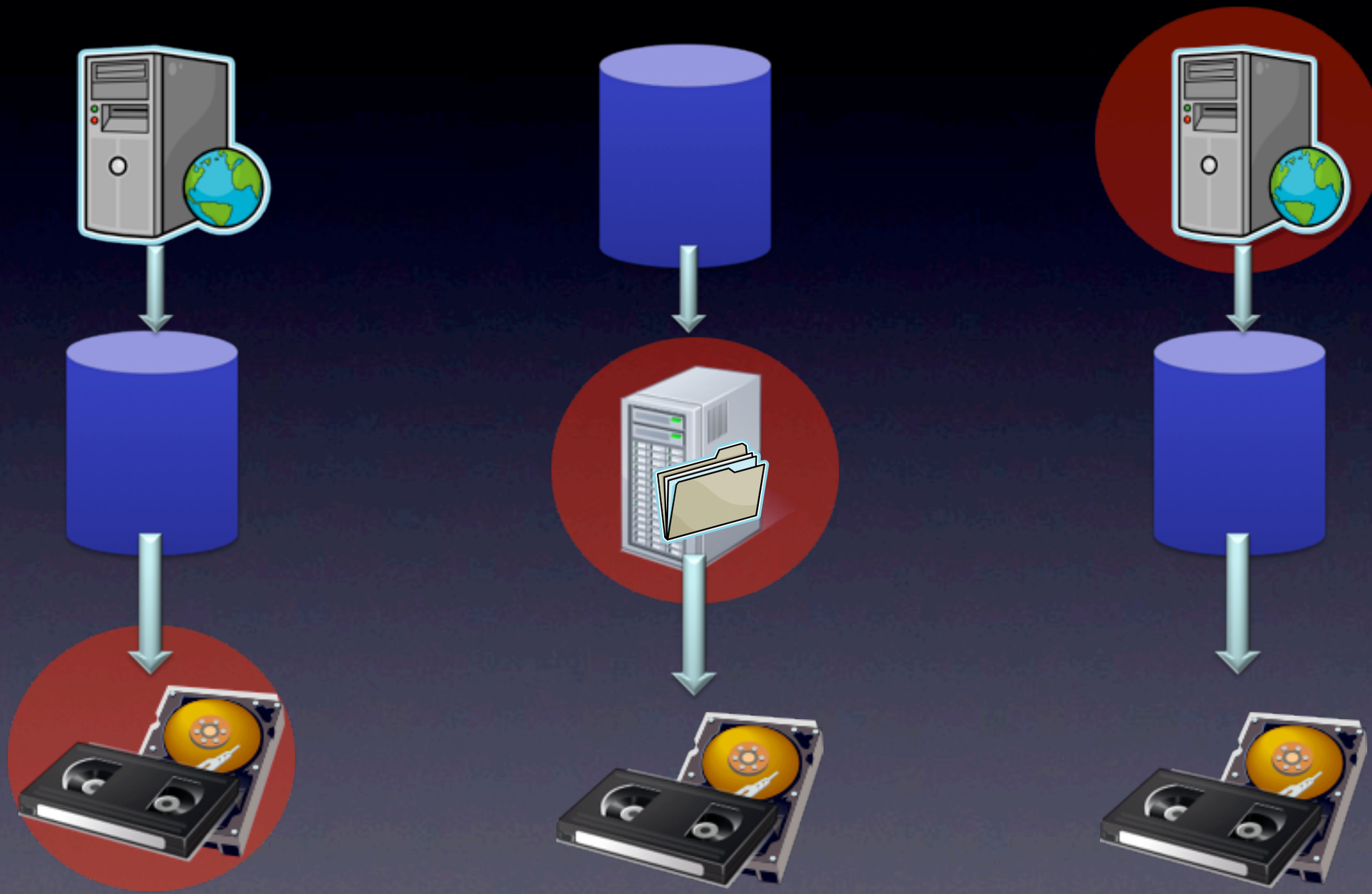
How Easy?

```
alter table accounts
   modify (ssn encrypt using 'AES128');
```

… that easy.

External Database Encryption



Media Encryption

OS/File

Application

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OS/File Encryption

- Data encrypted when written to disk
- Applied to all or part of database
- Protects data on media
- No modifications to application or database
- Keys secure from DBAs; options for HSM
- Easy to implement
- Performance advantage to TDE

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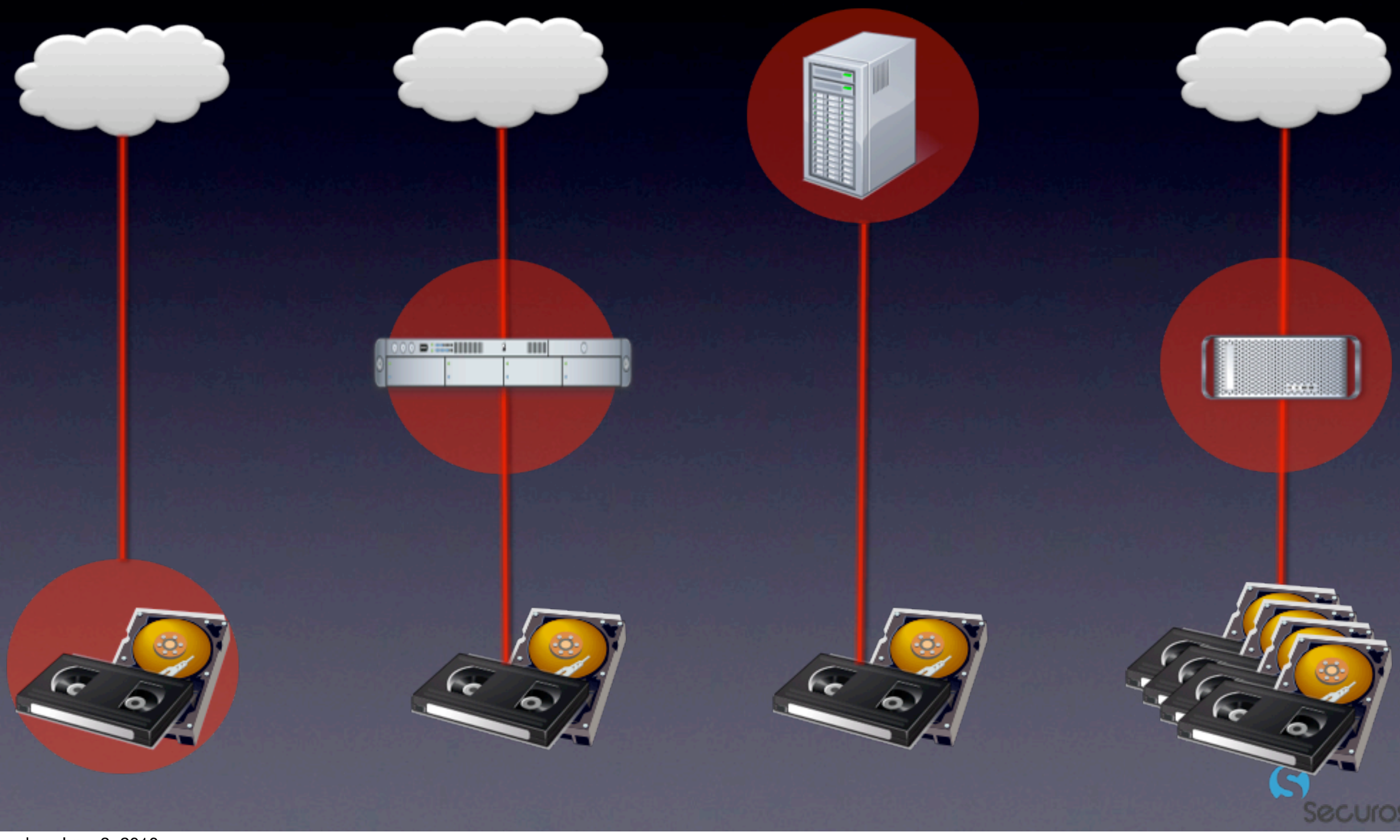
Tape/SAN Encryption Options

Drive

Inline

Server

Controller



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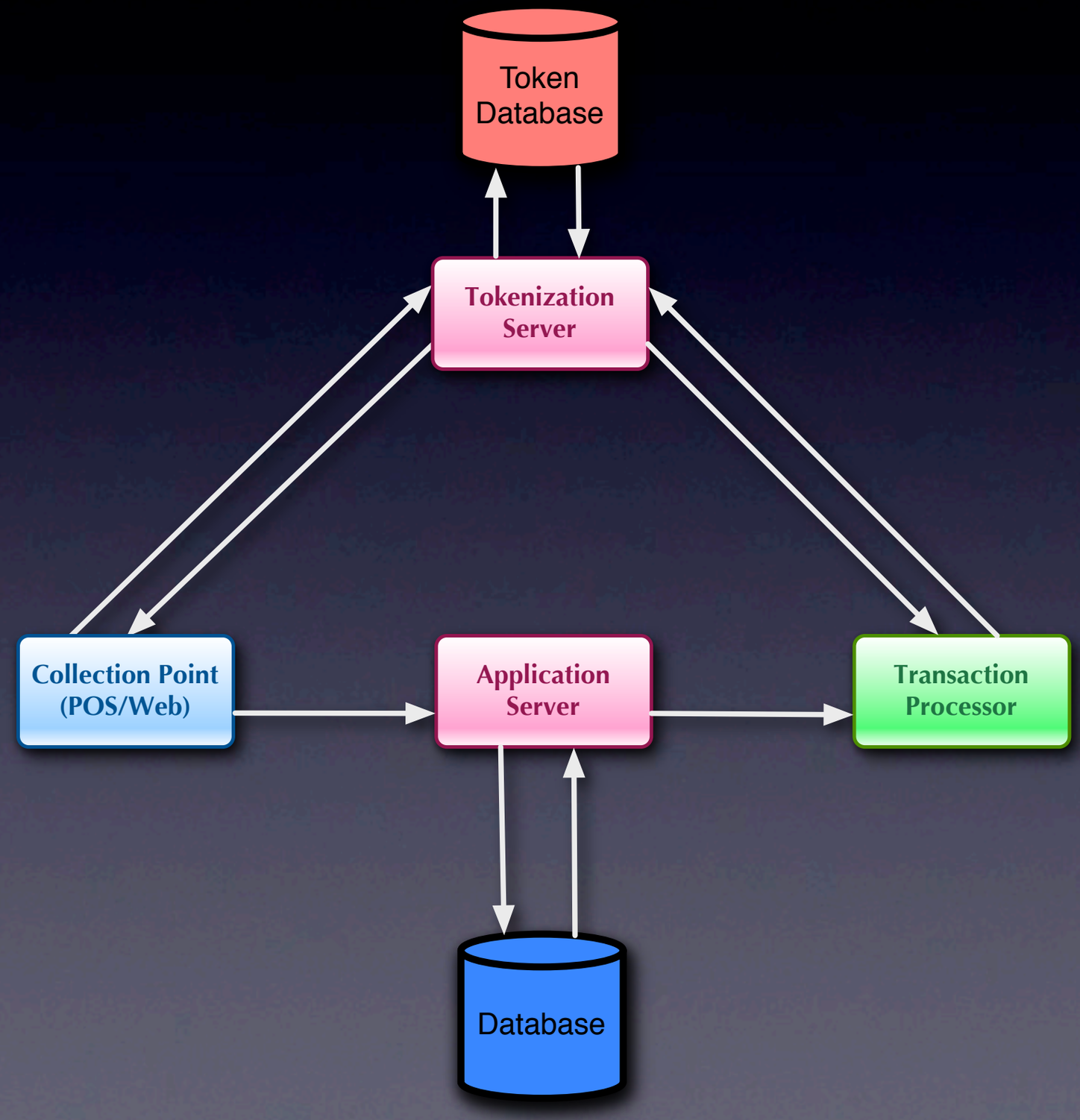
Media Encryption

- Protects data on media
- Keys secure from DBA
- Many variants (speed, cost, flexibility)
- Cost varies widely
- Not suitable for many regulatory requirements

Tokenization



Tokenization

- Token values can be completely random or pattern based.
- May reduce audit scope.
- May reduce application level changes.
- How tokens generated and stored is key.

Format Preserving Encryption

Reversible
Not NIST or PCI Approved
Can be based on AES

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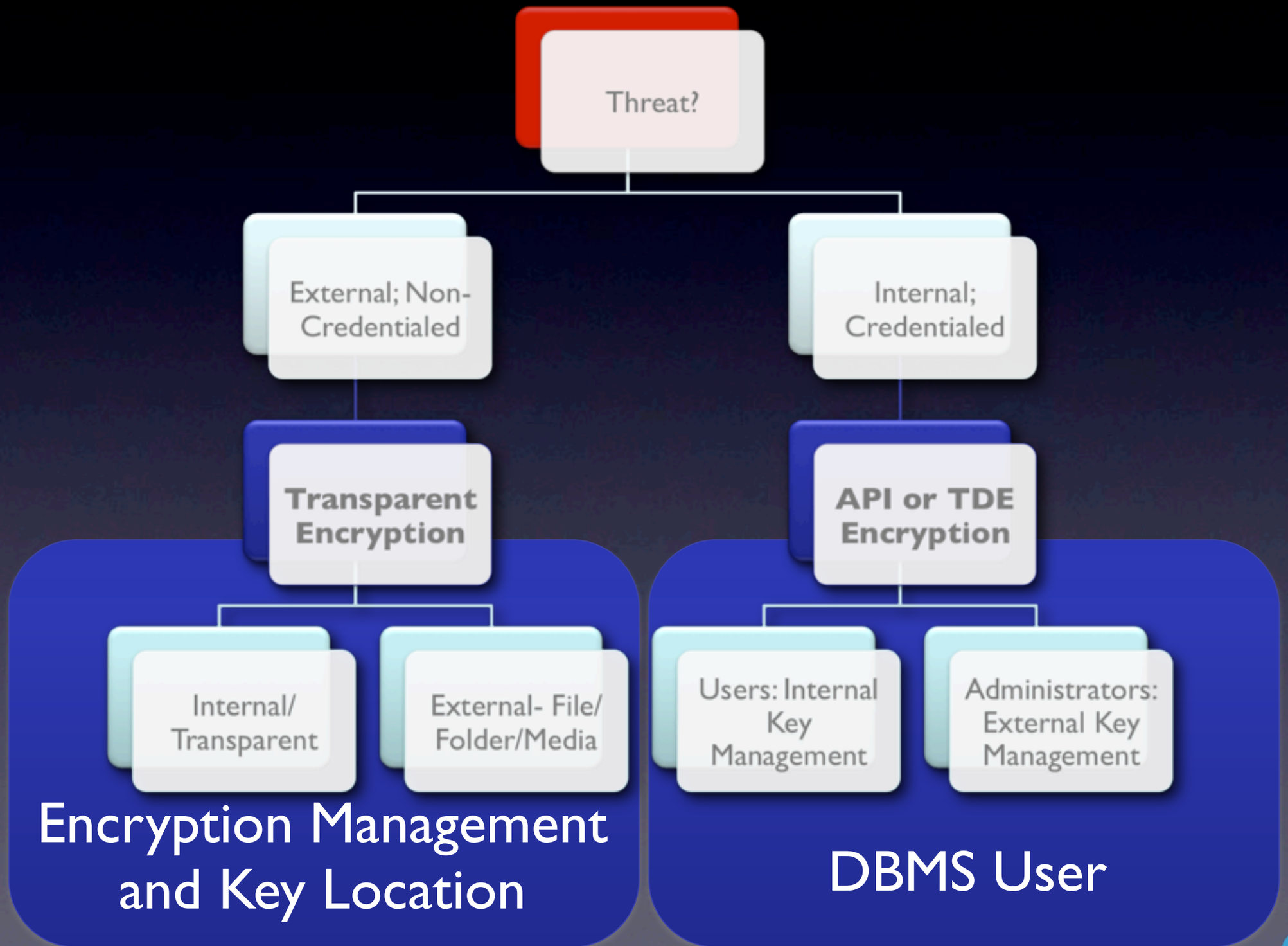
Encryption Selection Process



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Key Management

- Internal or external options for all variants
- Internal keys easier to use, cost effective
- External is more secure, provides SOD and offers more features
- External means more cost and complexity

Access Controls & Encryption

- Access Controls are very effective
- Encryption helps when access controls are not available
- Encryption supports access control, not a substitute
- Encryption offers secondary authentication
- Encryption with separation of duties

Data Masking

Data Masking

Production

ID	Name	SSN
1	Smith	111-22-3333
2	Jones	444-55-6666
3	Doe	777-88-9999

Development

ID	Name	SSN
1	Johns	123-45-6789
2	George	453-67-7356
3	Blike	245-12-7329

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Summary

- Transparent encryption for retrofitting applications / databases.
  - TDE is very simple, with no impact to operations
- Tokenization is an excellent option for applications.
- Beware conversion points- bad guys target encryption/ decryption locations and they study your transaction systems.
  - Memory parsing attacks on the rise.
- For financial services, application encryption with HSMs most common and best option (outside tokenization).

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