Automating data-protection across the enterprise

About 40 years ago....

- Primary protection problem
  - Some military communications and data
  - Some financial transactions
- Primary cryptographic algorithm
  - 56-bit DES
- Key-management
  - Manual
- Volume of data to be managed
  - Megabytes? Gigabyte?

20 years ago

- Primary protection problem
  - Most military communications and data
  - Some civil communications and data
  - Most financial transactions
- Primary cryptographic algorithms
  - Triple-DES, RSA, MD5
- Key-management
  - Semi-automatic and Manual
- Volume of data to be managed
  - Gigabytes? Terabyte?

Today

- Primary protection problem
  - Most military and civil communications and data
  - Most financial transactions
- Primary cryptographic algorithms
  - AES, 3DES, RSA, ECC, SHA-256,....
- Key-management
  - Automatic
- Volume of data to be managed
  - Petabytes? Exabytes?

Yet, the problem is....

- We're still trying to protect the network
- We're still relying on secret-key sharing for passwords
- We're still protecting data with ad hoc data-protection
  - Reacting to PCI-DSS
  - Reacting to HIPAA
  - Reacting to EU Directive
  - Reacting...
  - Reacting...

What is the solution?

- A proactive approach to security that starts by:
  - Defending the core first: the data
  - Hardening the system next
  - Assuming the network cannot be trusted
- Something to protect data on a massive scale
- Something that is ubiquitous across the enterprise (DNS)
- Something that is not an application-specific silo
- Something that meets today's needs and anticipates tomorrow's

DATA ENCRYPTION INFRASTRUCTURE (DEI)

What is a DEI? - 1

- Standard network service to encrypt/decrypt billions of documents/media files
- Hide complexity from software developers by exposing a simple web-service interface
- Work with any programming language on any platform
- Stores ciphertext anywhere – public clouds, private clouds, SAN, NAS, etc.
- Centrally manage cryptographic keys in accordance with security regulations and industry standards

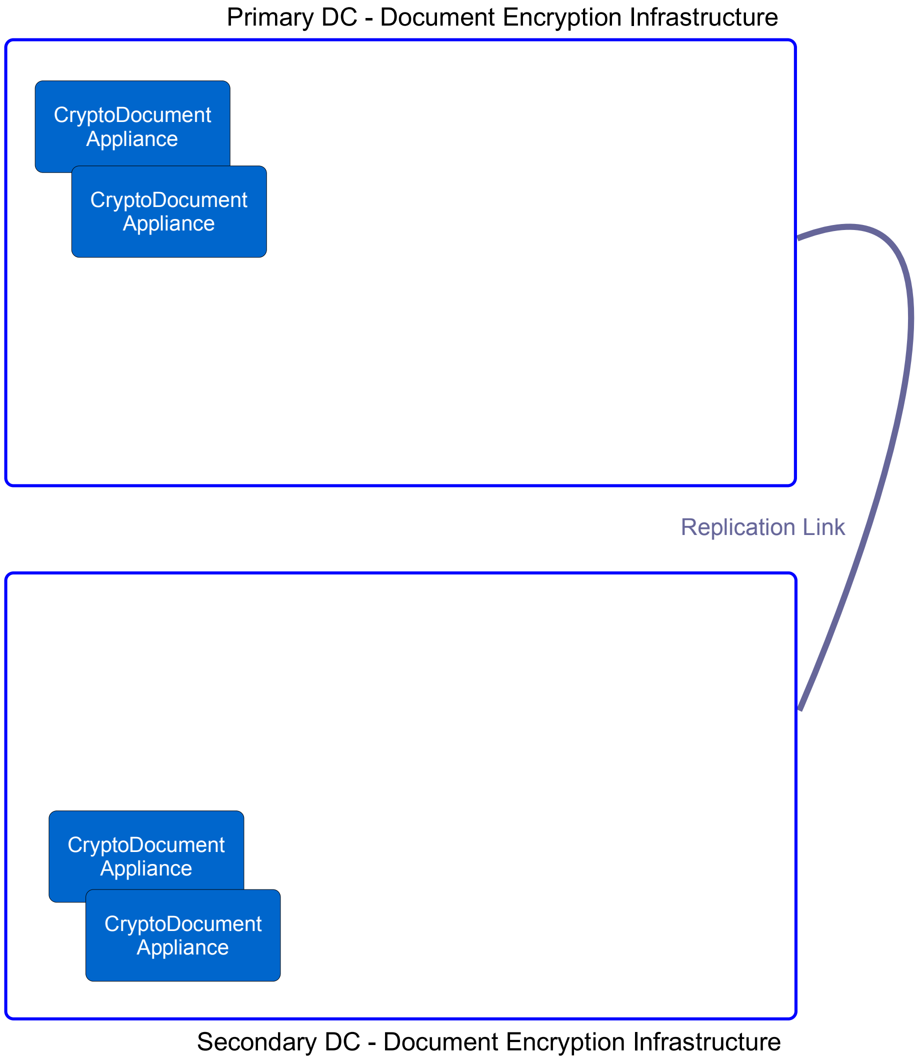
What is a DEI? - 2

- Support synchronous and asynchronous services for service-prioritization
- Auto-scale cryptographic capacity to handle volume-spikes while conserving resources during volume-slumps
- Automatically load-balance to even out performance peaks/valleys
- Be highly-availabile
- Integrate to centralized IAM
- Support auditing at all levels of the infrastructure

DATA ENCRYPTION INFRASTRUCTURE REFERENCE IMPLEMENTATION (DEIRI)

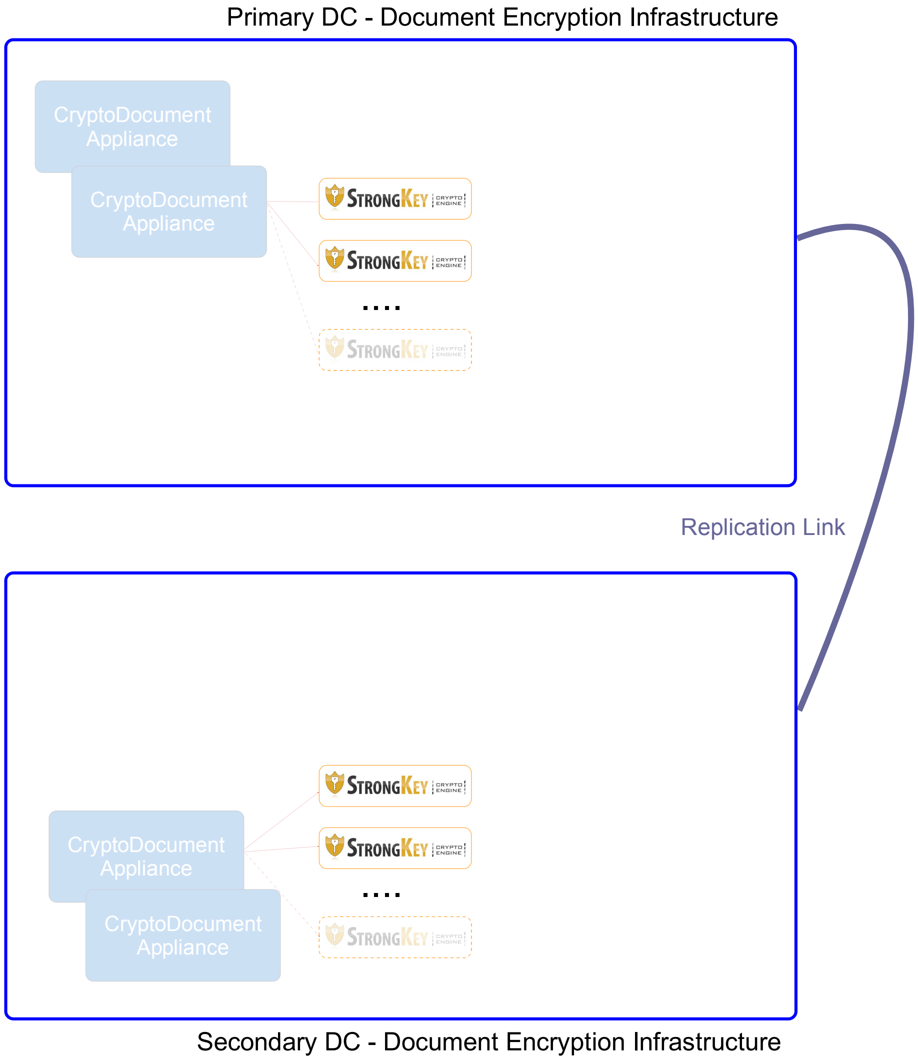
DEI Components - 1

Front-end Processors (FEP) to manage the infrastructure and serve as the primary interface to the DEI.



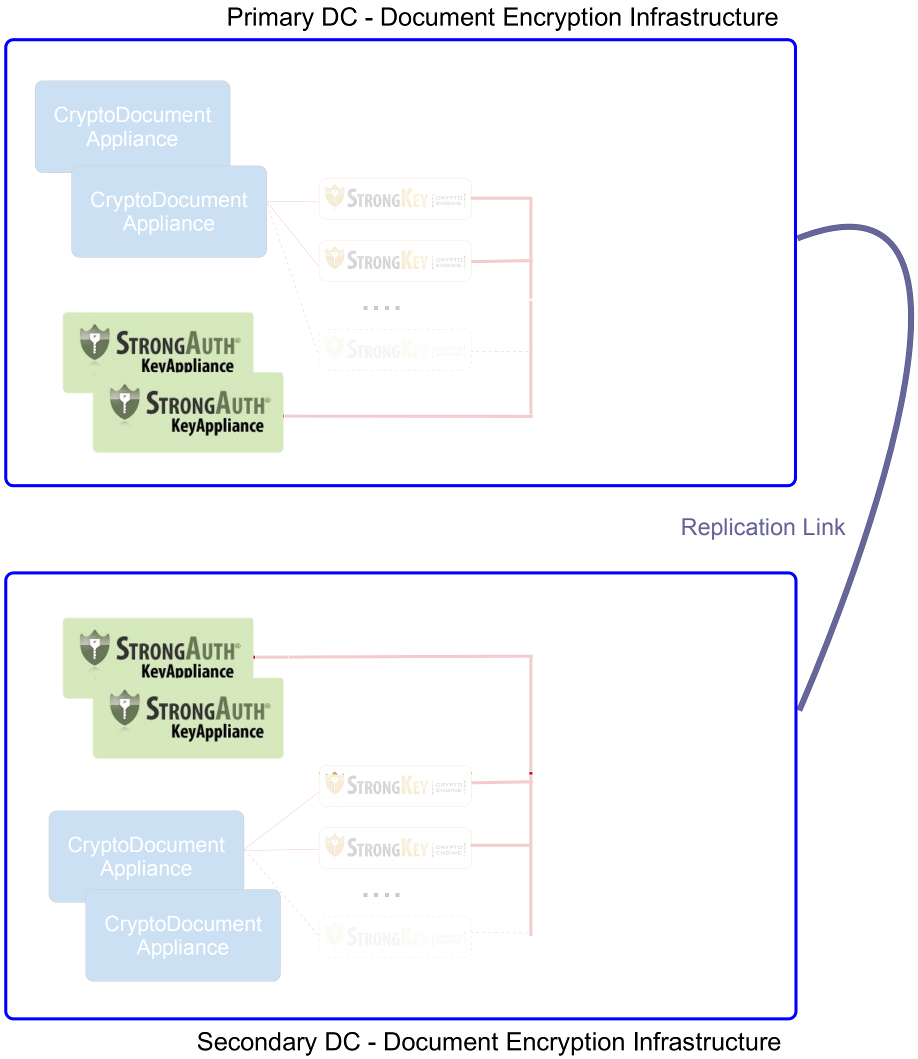
DEI Components - 2

Auto-scaling private cloud of **CryptoEngines** to perform the cryptographic operations.



DEI Components - 3

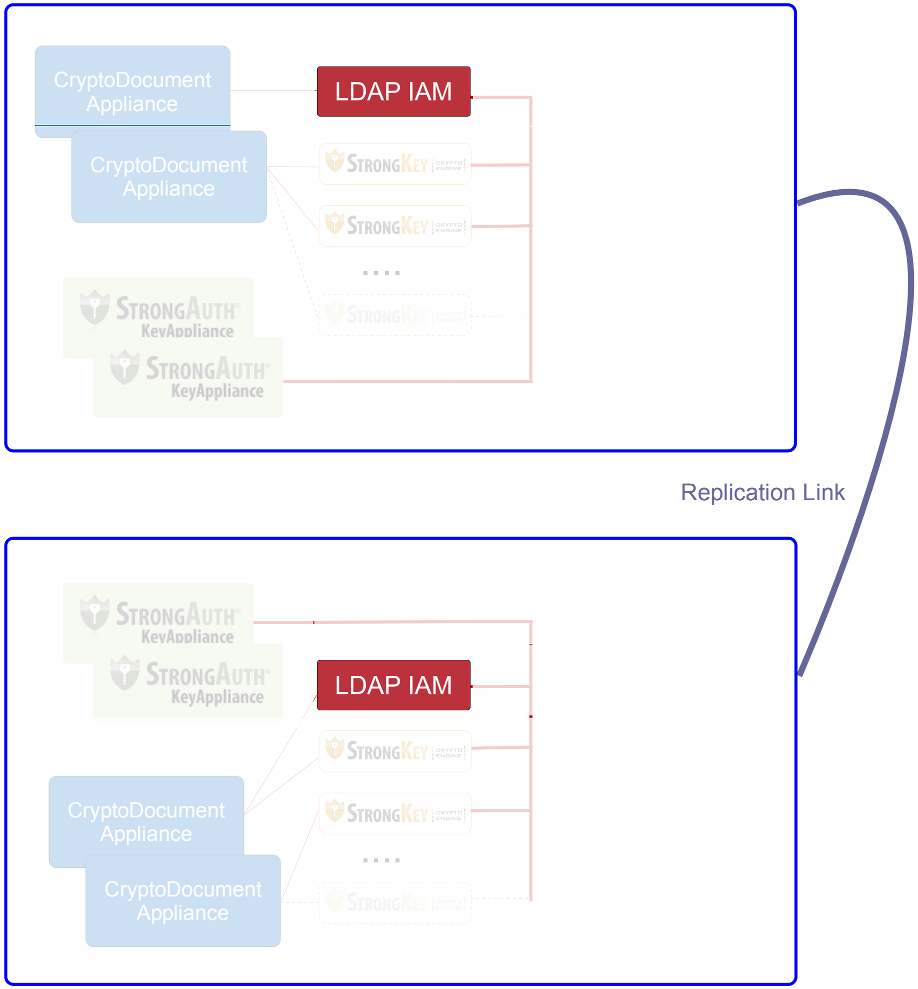
Key Management System (KMS) to manage billions of cryptographic keys centrally.



DEI Components - 4

IAM system to manage centralized access control.

Primary DC - Document Encryption Infrastructure

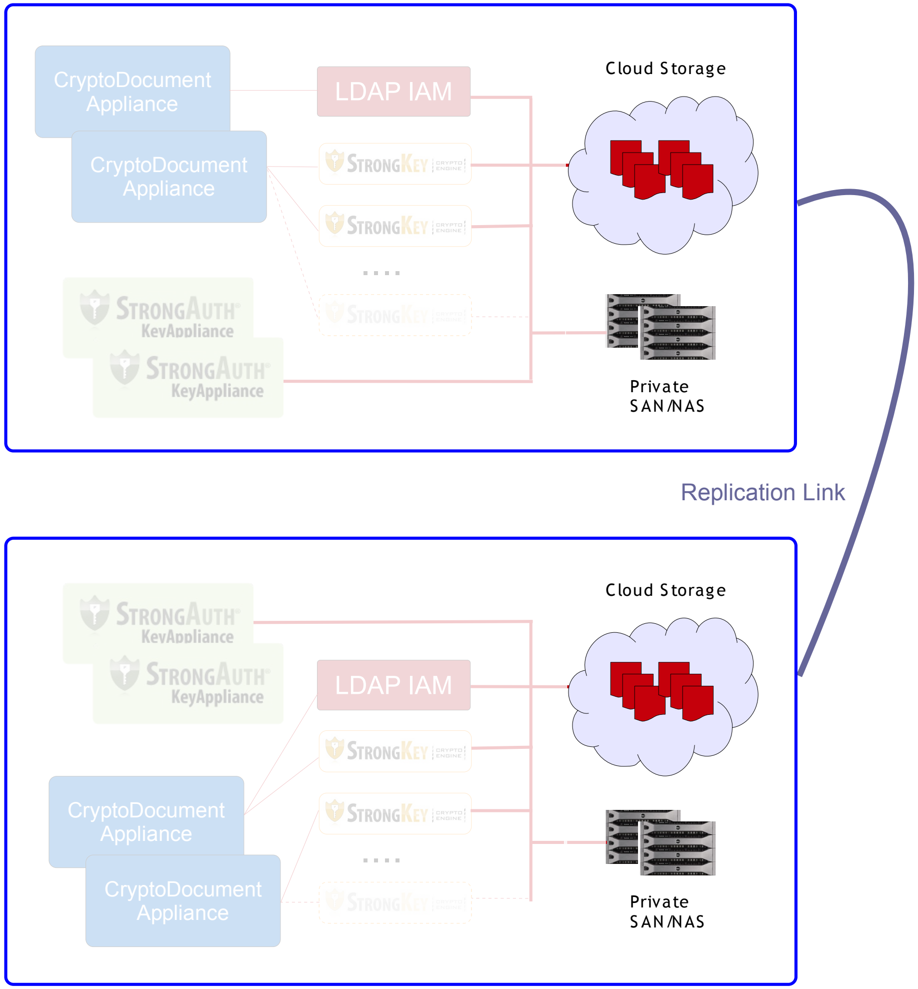


Secondary DC - Document Encryption Infrastructure

DEI Components - 5

Private or Public Cloud, or a private SAN/NAS to store encrypted data.

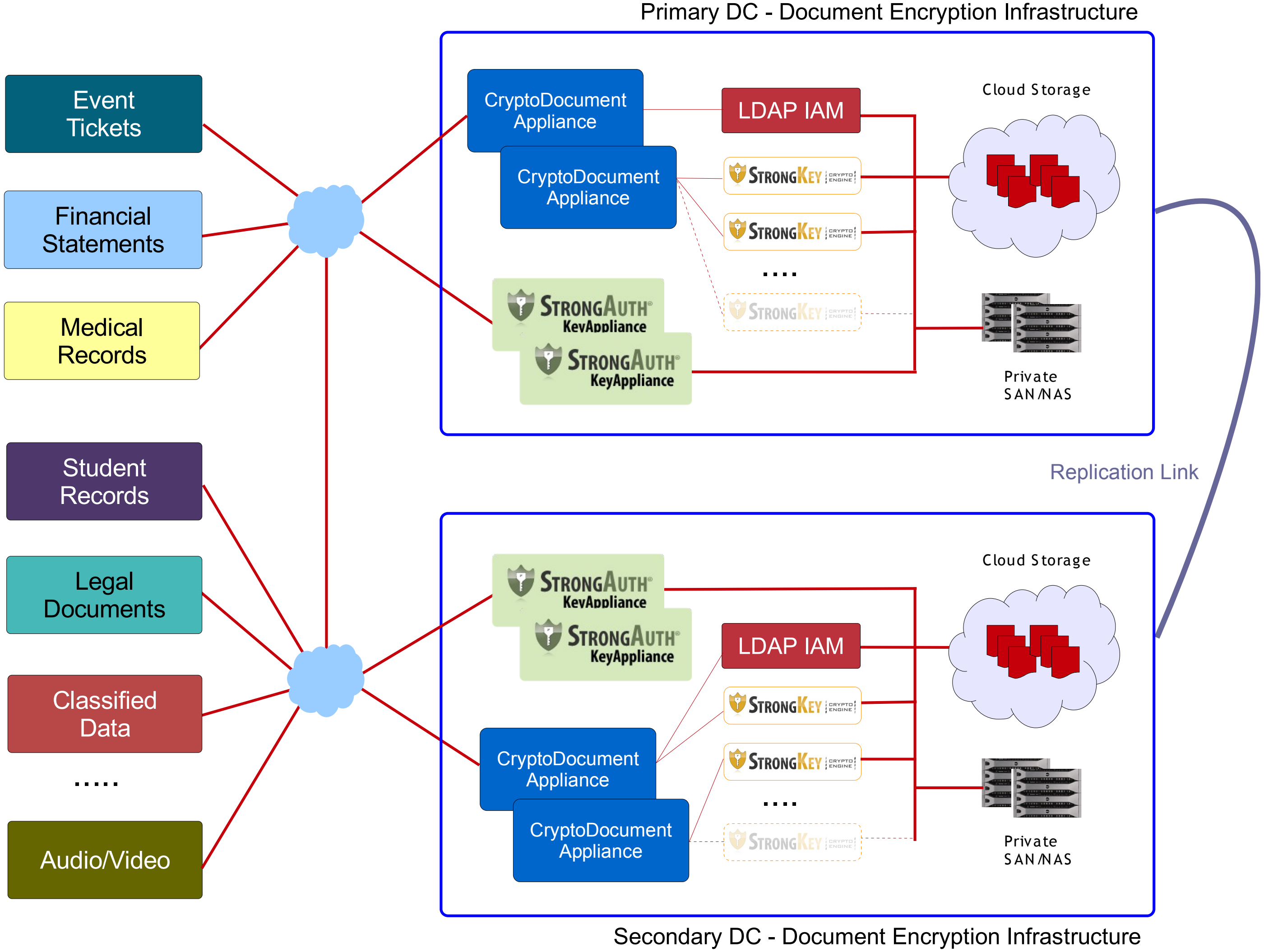
Primary DC - Document Encryption Infrastructure



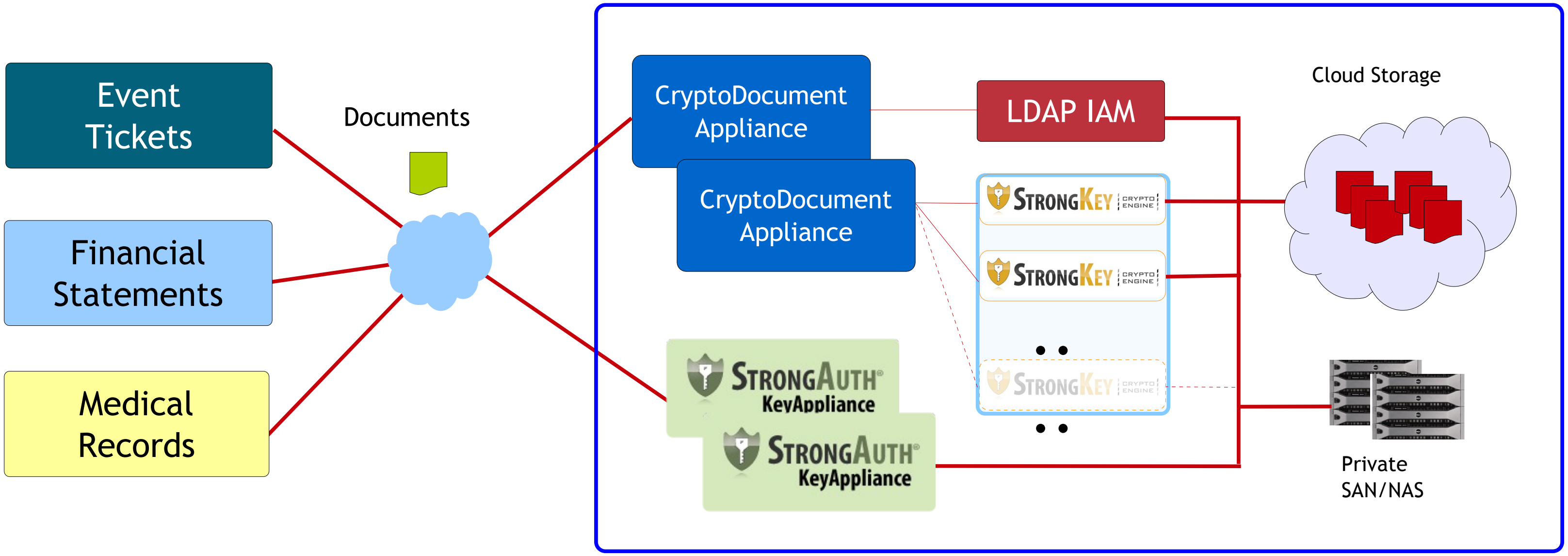
Secondary DC - Document Encryption Infrastructure

Finally...

Applications to take advantage of the DEI.



How does it work?



Performance

- FEP: 6-Core, 64-bit, 3.2 Ghz CPU, 16GB DRAM, 1600 Mhz, Gigabit network, 64-bit Linux, JEE5 AppServer, RDBMS
- CE: VM's with single-core, 64-bit, 3.1 Ghz CPU, 8GB DRAM, 1600 Mhz, Gigabit NW, 64-bit Linux, JEE5 AS
- KMS: 6-Core, 64-bit, 3.2 Ghz CPU, 8GB DRAM, 1600 Mhz, Gigabit network, 64-bit Linux, JEE5 AppServer, RDBMS
- IAM: External Active Directory
- Storage: NFS-mounted NAS

Performance

- 8+ Million PDF documents of 50-200K size each
- 20-25K average new documents per day; 50K peak load
- 300ms encryption
- 200ms decryption
- Base64-encoded images of 2-3K size each
- 100 WS-TPS
- Internal testing: 1-Gigabyte per minute encryption

Resources

- Data Encryption Infrastructure (DEI)
  - http://www.infoq.com/articles/cloud-data-encryption-infrastructure
- Regulatory Compliant Cloud Computing (RC3)
  - http://www.ibm.com/developerworks/cloud/library/cl-regcloud/index.html
  - http://www.infoq.com/articles/regulatory-compliant-cloud-computing
  - http://bit.ly/rc3issa
- Cryptographic engine (enables RC3 applications)
  - http://www.cryptoengine.org
- CryptoCabinet (RC3 sample application)
  - http://www.cryptocabinet.org

Questions?

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