Cynops

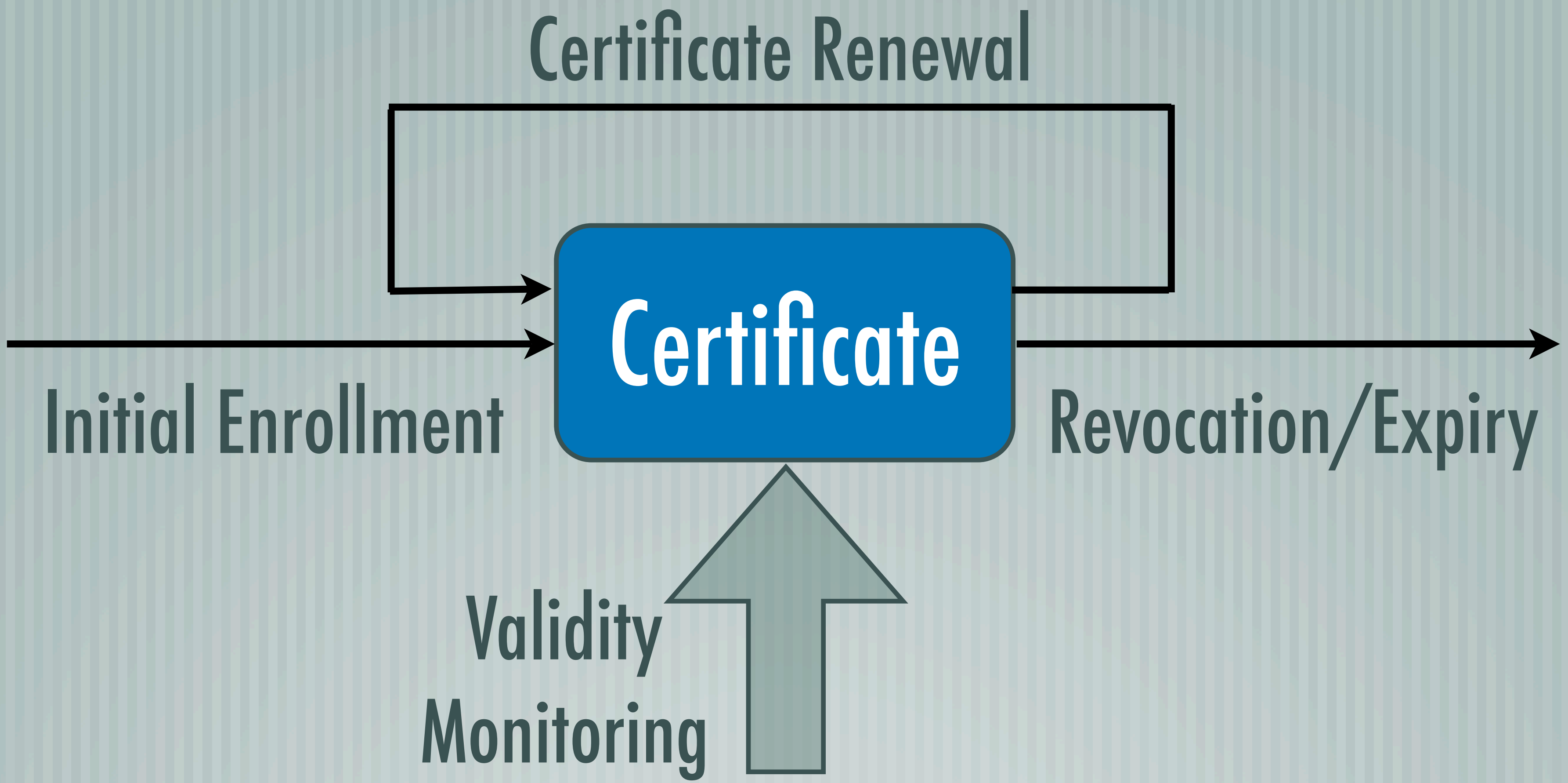
network security engineering

Advanced SCEP Use

Certificate Lifecycle Management with SCEP

2005-10-18 – Martin Bartosch

Certificate Lifecycle



Certificate Renewal

Certificate

Initial Enrollment

Revocation/Expiry

Validity Monitoring

Real-life Certificate Use

- PKI enabled applications require (valid) certificates
- Obvious approach: manual administration
  - Request certificate
  - Install certificate
  - Note expiry date in calendar and...

    ...don’t forget to request new certificate prior to expiry
  - Repeat. Don’t make mistakes.

Real-life Certificate Use (2)

- Manual certificate administration
  - does not scale
  - is error prone
  - is a management and support nightmare
- Enter automatic certificate management

Certificate Management Protocols

- PKIX-CMP (Certificate Management Protocol)
  - RFC 2510, RFC 2511; not widely used
- CMC (CM over CMS, no transport defined)
  - RFC 2797, used by Microsoft CA (with COM/DCOM as proprietary transport protocol)
- SCEP (IETF Draft version 12, PKCS#10 in PKCS#7 over HTTP)
  - de-facto standard for network appliances (Cisco etc.)
  - **supported by OpenCA**

OpenCA SCEP Support

- Certificate Lifecycle Management possible via SCEP:
  - Initial enrollment
  - Renewal

Initial Enrollment

- Anonymous enrollment (no authentication)
  - **supported** by OpenCA (as of today)
- Pre-authentication (preshared key)
  - **not supported**
- Signature with existing certificate issued by CA
  - not explicitly defined by SCEP draft (as of version 12)
  - currently being tested **(to be supported soon)**

Certificate Renewal

- Authenticate new request by signing with existing certificate
  - Signature and signer certificate must be valid **and**
  - Signer DN == requested DN **and**
  - Not more than two valid certs with the same DN
- Automatic approval possible
- Renewal requests inherit original RA and Role

SCEP Server Configuration

- Policy definition
  - Allow Enrollment
  - Allow Renewal
  - Automatic Renewal Approval

etc/servers/scep.conf:

```
# ScepAllowEnrollment: if set to "NO"
# the SCEP server will not accept requests
# for certificate DNs that don't exist yet.
ScepAllowEnrollment     "YES"

# ScepAllowRenewal: if set to "YES" the SCEP
# server will allow renewal requests for
# existing certificates.
ScepAllowRenewal        "YES"

# ScepAutoApprove: if set to "YES" and
# SCEP request is signed with already existing
# end entity certificate the request is
# automatically approved in the RA.
ScepAutoApprove         "NO"
```

SCEP Server Configuration

- Request processing
  - Accept request extensions
  - Default request settings

etc/servers/scep.conf:

```
# ScepKeepSubjectAltName: parse incoming
# request and keep supplied SubjectAltName
ScepKeepSubjectAltName  "YES"


# Defaults for initial enrollment
#  Change these according to your setup
ScepDefaultRole         "VPN Server"
ScepDefaultRA           "Trustcenter itself"
```

SCEP Server Configuration

- Request processing
  - Matching renewal requests with existing certs
  - Request selection of Certificate Role (via PKCS#10 attribute, initial enrollment, currently testing)

etc/servers/scep.conf:

```
# ScepRenewRDNMatch: List of request RDNs that
# must match an existing certificate to
# identify the request as a renewal
#  Example: "CN,O,C"
#  Note: CN might not be enough for your
#  case if your CNs are not unique. In
#  this case add additional RDN components,
#  such as OU, O or DC in order to allow
#  a match.
ScepRenewalRDNMatch     "CN"
```

Certificate Monitoring

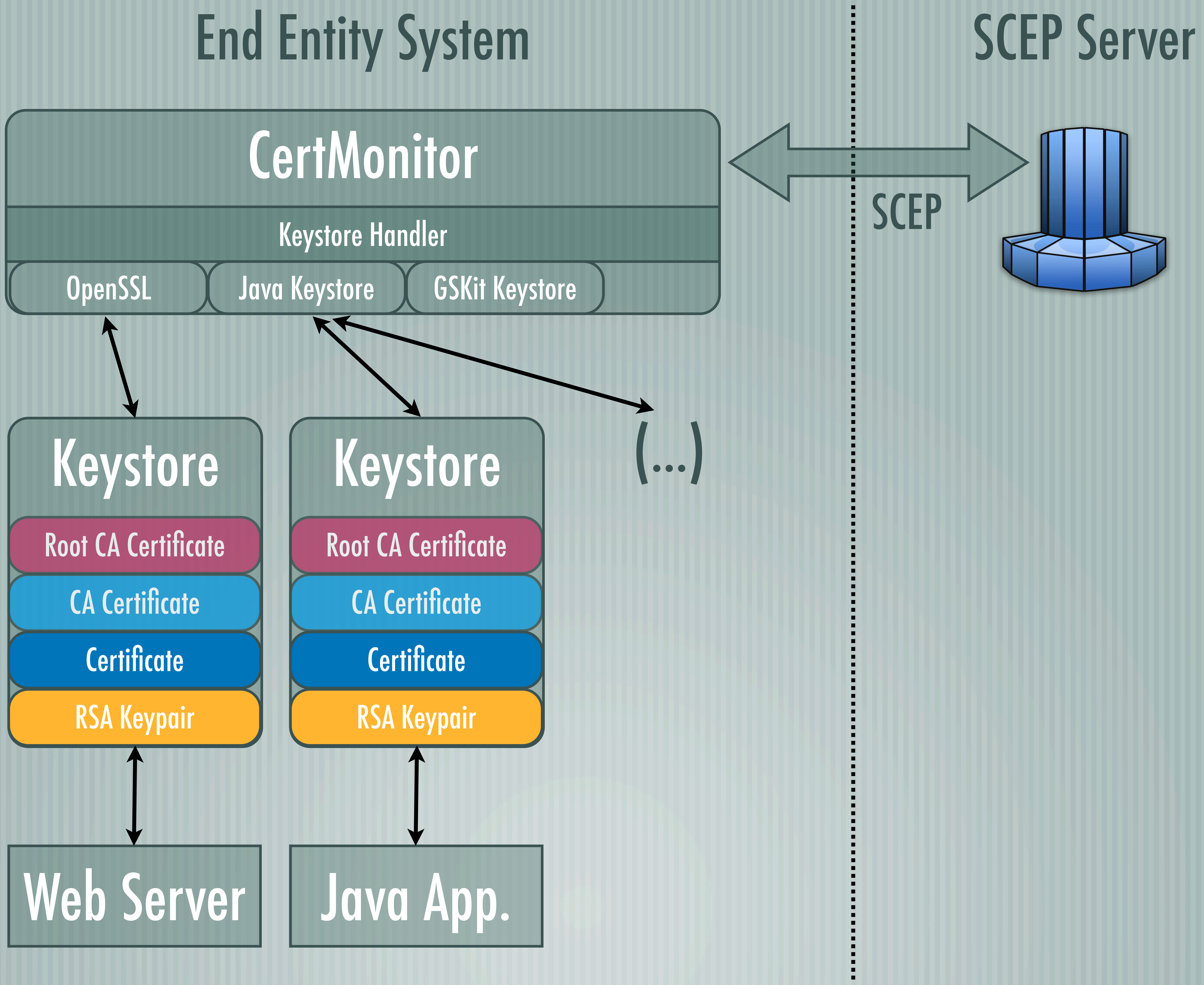
- CA based monitoring is not useful
  - CA cannot easily keep track of responsible persons
- Client based approach
  - on each client deploy some “agent” software
  - invoked daily (cron job)
    - monitor all local keystores
    - check remaining certificate validity
    - automatically enroll renewal requests

SCEP Clients

- **sscep**: Unix SCEP client written in C
  - handles raw SCEP communication
  - no workflow handling
  - http://www.klake.org/~jt/sscep/
- **autoscep**: Unix SCEP renewal client written in C
  - based on sscep
  - limited keystore support (PEM format only)
  - http://autosscep.spe.net/
- **scepclient**: Java SCEP client
  - http://www.urut.ch/scep/

SCEP Clients: CertMonitor

- **CertMonitor**: Certificate monitoring agent (Perl)
  - GPL’ed code
  - handles renewal workflow
  - completely automatic operation (cron)
  - requires and encapsulates OpenSSL and sscep
  - can manage an arbitrary number of local keystores
  - multi-platform support
  - multi-keystore-type support



End Entity System

SCEP Server

CertMonitor

Keystore Handler

OpenSSL

Java Keystore

GSKit Keystore

SCEP

Keystore

Root CA Certificate

CA Certificate

Certificate

RSA Keypair

Keystore

Root CA Certificate

CA Certificate

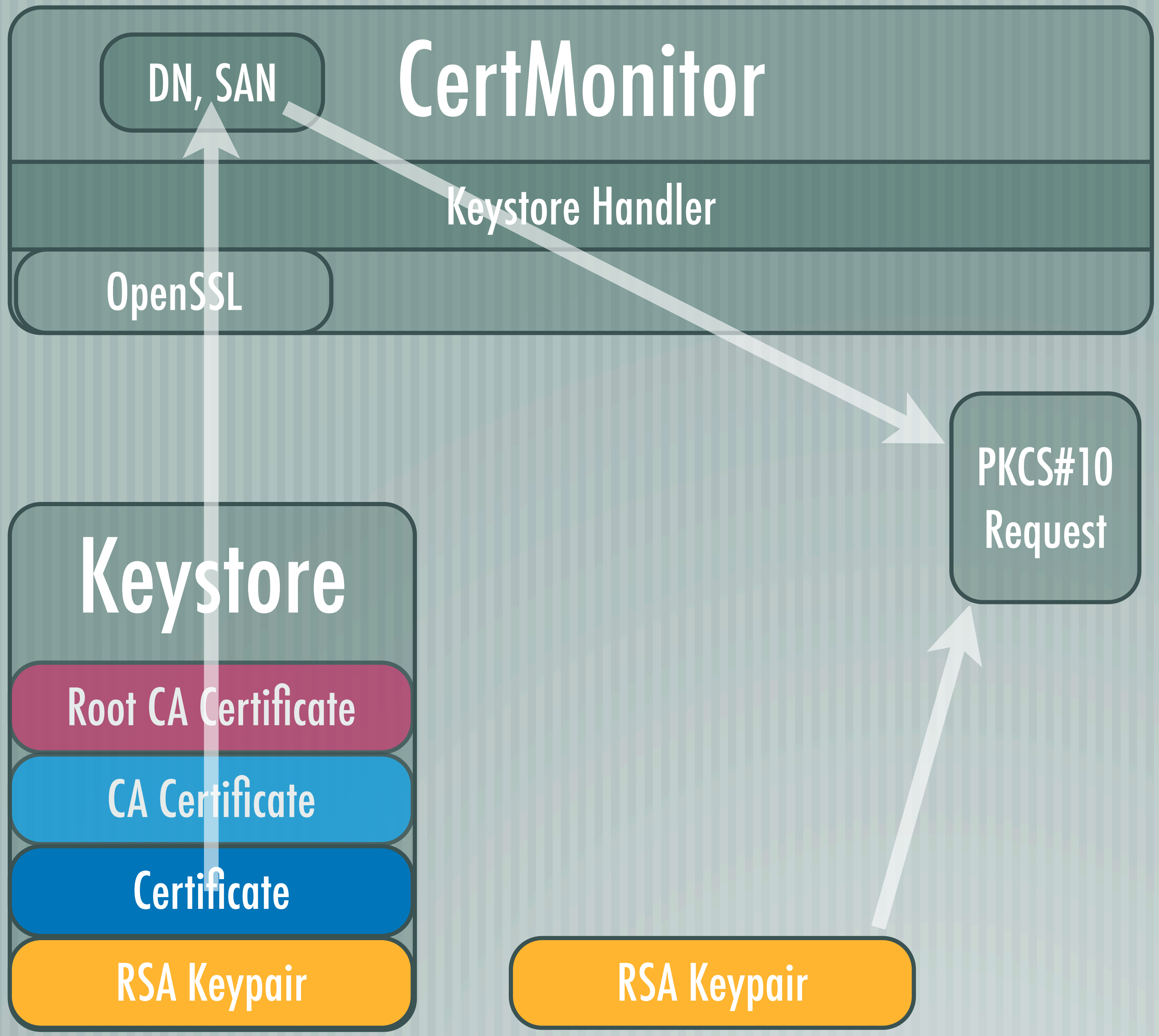
Certificate

RSA Keypair

(...)

Web Server

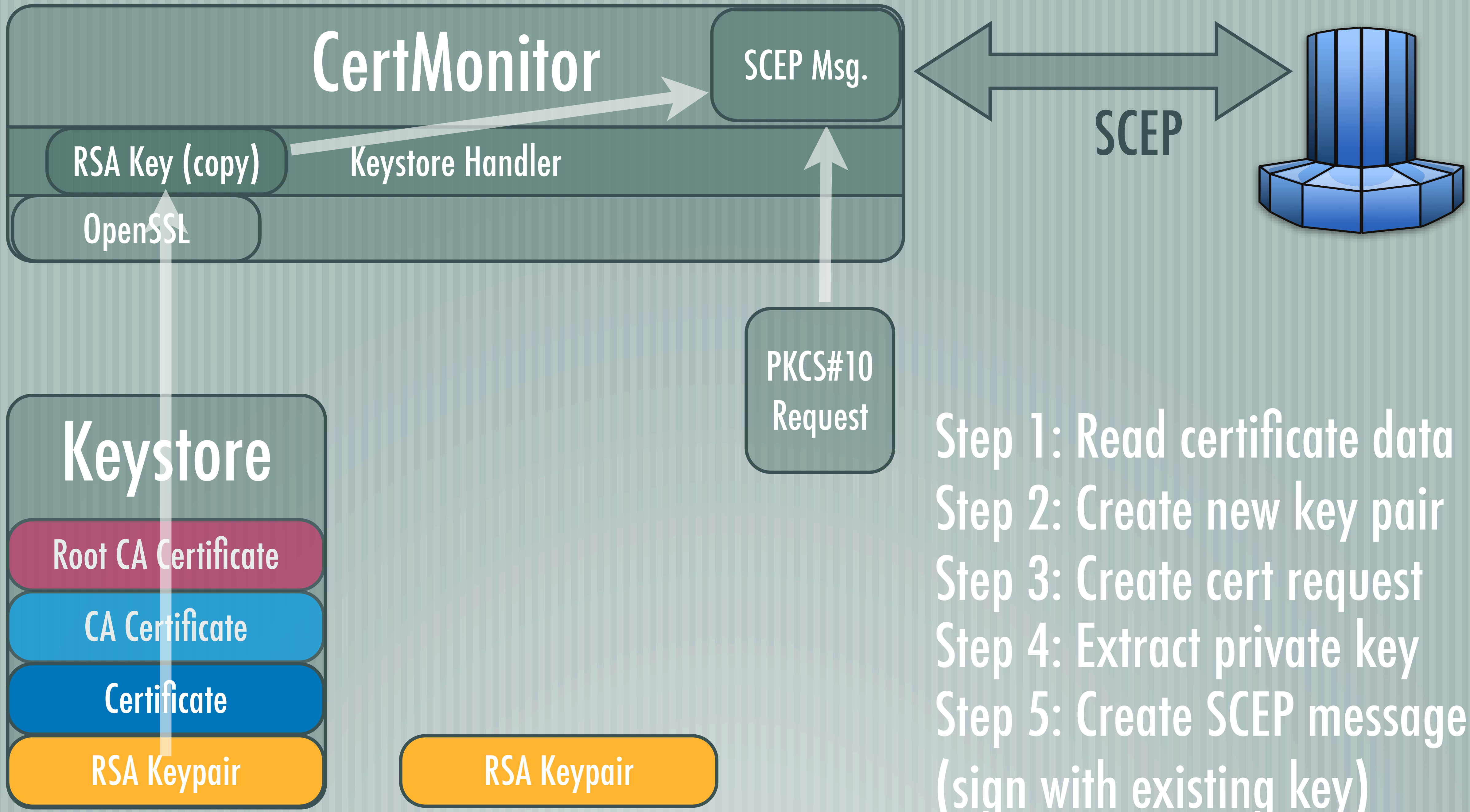
Java App.



Step 1: Read certificate data

Step 2: Create new key pair

Step 3: Create cert request



CertMonitor

SCEP Msg.

RSA Key (copy)

Keystore Handler

OpenSSL

SCEP

PKCS#10
Request

Keystore

Root CA Certificate

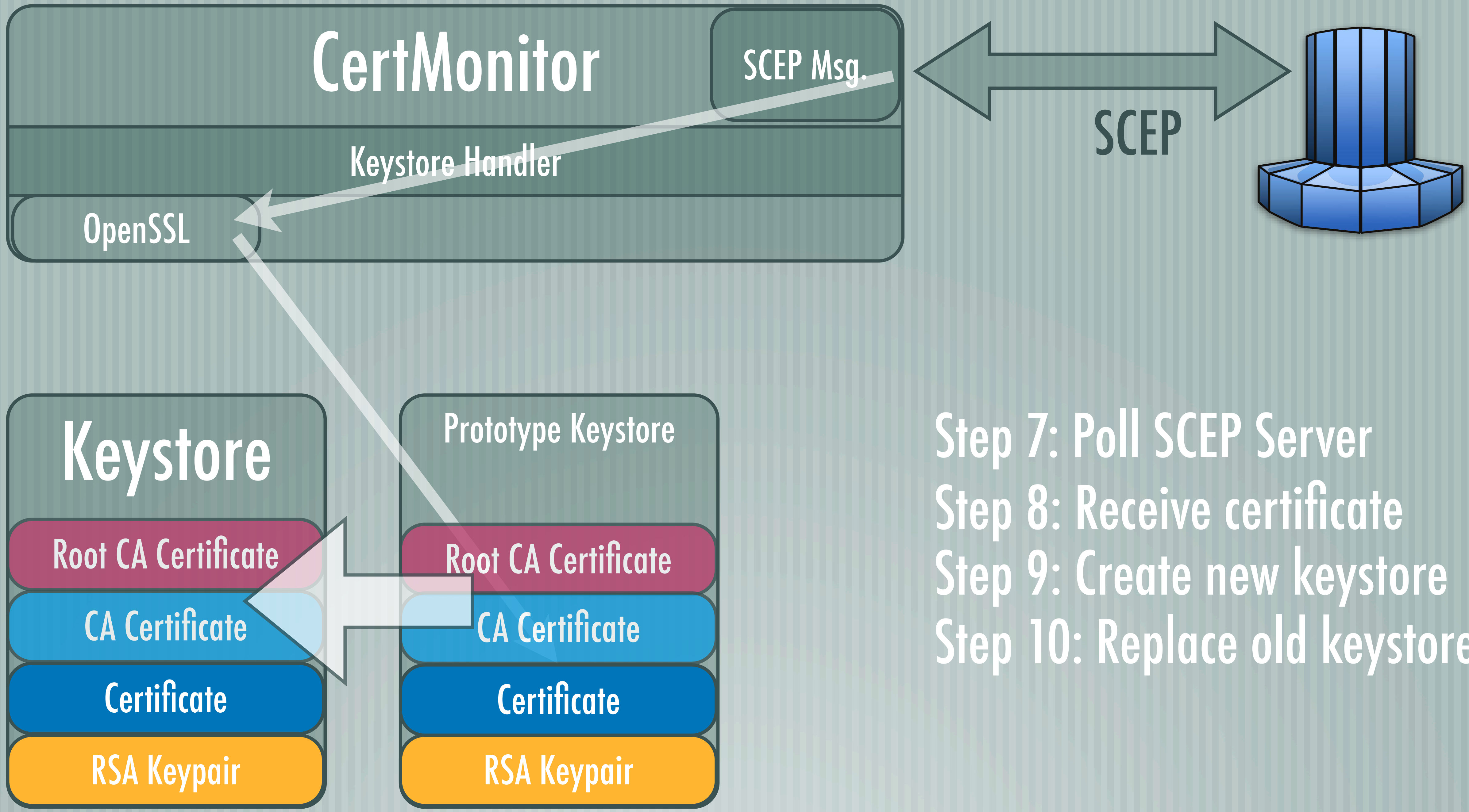
CA Certificate

Certificate

RSA Keypair

RSA Keypair

Step 1: Read certificate data
Step 2: Create new key pair
Step 3: Create cert request
Step 4: Extract private key
Step 5: Create SCEP message
(sign with existing key)
Step 6: Send SCEP message



Step 7: Poll SCEP Server

Step 8: Receive certificate

Step 9: Create new keystore

Step 10: Replace old keystore

CertMonitor

- Platforms supported: Unix (Linux, AIX, Solaris, Mac OS X...)
  - Support planned for: Windows, z/OS, Tandem
- Multi-Keystore support:
  - OpenSSL format (PEM encoded certs/keys)
  - IBM GSKit Keystore format (MQ Series)
  - Java Keystore (planned)
  - RACF (planned: access from USS via REXX)

Infrastructure Resiliency

- CA side support for Rollover is required for infrastructure resiliency
  - Enter Multi-CA and CA Rollover Support

Thanks for your attention!

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