KMIP Suite B Profile Version 1.0

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Related work:
This specification is related to:

Abstract:
Describes a profile for KMIP clients and KMIP servers using Suite B cryptography that has been approved by NIST for use by the U.S. Government and specified in NIST standards or recommendations.

Status:
This document was last revised or approved by the OASIS Key Management Interoperability Protocol (KMIP) TC on the above date. The level of approval is also listed above. Check the “Latest version” location noted above for possible later revisions of this document.

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[kmip-suite-b-v1.0]
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1 Introduction

For normative definition of the elements of KMIP see the KMIP Specification [KMIP-SPEC] and the KMIP Profiles [KMIP-PROF].

Illustrative guidance for the implementation of KMIP clients and servers is provided in the KMIP Usage Guide [KMIP-UG].

Suite B [SuiteB] requires that key establishment and signature algorithms be based upon Elliptic Curve Cryptography and that the encryption algorithm be AES [FIPS197]. Suite B includes:

<table>
<thead>
<tr>
<th>Encryption</th>
<th>Advanced Encryption Standard (AES) (key sizes of 128 and 256 bits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Signature</td>
<td>Elliptic Curve Digital Signature Algorithm (ECDSA) (using the curves with 256-bit and 384-bit prime moduli)</td>
</tr>
<tr>
<td>Key Exchange</td>
<td>Elliptic Curve Diffie-Hellman (ECDH), (using the curves with 256-bit and 384-bit prime moduli)</td>
</tr>
<tr>
<td>Hashes</td>
<td>SHA-256 and SHA-384</td>
</tr>
</tbody>
</table>

Suite B provides for two levels of cryptographic security, namely a 128-bit minimum level of security (minLOS_128) and a 192-bit minimum level of security (minLOS_192). Each level defines a minimum strength that all cryptographic algorithms must provide. A KMIP product configured at a minimum level of security of 128 bits provides adequate protection for classified information up to the SECRET level. A KMIP product configured at a minimum level of security of 192 bits is required to protect classified information at the TOP SECRET level.

The Suite B non-signature primitives are divided into two columns as shown below.

<table>
<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encryption</td>
<td>AES-128</td>
</tr>
<tr>
<td>Key Agreement</td>
<td>ECDH on P-256</td>
</tr>
<tr>
<td>Hash for PRF/MAC</td>
<td>SHA-256</td>
</tr>
</tbody>
</table>

At the 128-bit minimum level of security, the non-signature primitives MUST either come exclusively from Column 1 or exclusively from Column 2.

At the 192-bit minimum level of security, the non-signature primitives MUST come exclusively from Column 2.

Digital signatures using ECDSA MUST be used for authentication. Following the direction of RFC 4754, ECDSA-256 represents an instantiation of the ECDSA algorithm using the P-256 curve and the SHA-256 hash function. ECDSA-384 represents an instantiation of the ECDSA algorithm using the P-384 curve and the SHA-384 hash function.

If configured at a minimum level of security of 128 bits, a KMIP product MUST use either ECDSA-256 or ECDSA-384 for authentication. It is allowable for one party to authenticate with ECDSA-256 and the other party to authenticate with ECDSA-384. This flexibility will allow interoperability between a KMIP client and server that have different sizes of ECDSA authentication keys. KMIP products configured at a minimum level of security of 128 bits MUST be able to verify ECDSA-256 signatures and SHOULD be able to verify ECDSA-384 signatures.
ECDSA-384 signatures. If configured at a minimum level of security of 192 bits, ECDSA-384 MUST be used by both the KMIP client and server for authentication. KMIP products configured at a minimum level of security of 192 bits MUST be able to verify ECDSA-384 signatures.

KMIP products, at both minimum levels of security, MUST each use an X.509 certificate that complies with the “Suite B Certificate and Certificate Revocation List (CRL) Profile” [RFC5759] and that contains an elliptic curve public key with the key usage bit set for digital signature.

1.1 Terminology

The key words "MUST", "SHALL", "SHOULD", and "MAY" in this document are to be interpreted as described in [RFC2119].

1.2 Normative References


[KMIP-SPEC] One or more of [KMIP-SPEC-1_0], [KMIP-SPEC-1_1], [KMIP-SPEC-1_2]


[KMIP-PROF] One or more of [KMIP-PROF-1_0], [KMIP-PROF-1_1], [KMIP-PROF-1_2]


1.3 Non-Normative References

[KMIP-UG] One or more of [KMIP-UG-1_0], [KMIP-UG-1_1], [KMIP-UG-1_2]


[KMIP-TC-1_2] Key Management Interoperability Protocol Test Cases Version 1.2, Committee Note Draft, DD MMM YYYY.


2 Suite B minLOS_128 Profile

The Suite B minLOS_128 Profile describes a KMIP client interacting with a KMIP server as an information assurance product to provide a minimum level of security of 128 bits. (http://www.nsa.gov/ia/programs/suiteb_cryptography/)

2.1 Authentication Suite

Implementations conformant to this profile SHALL use TLS to negotiate a mutually-authenticated connection.

2.1.1 Protocols

Conformant KMIP clients and servers SHALL support:

- TLS v1.2 [RFC5246]

2.1.2 Cipher Suites

Conformant KMIP servers SHALL support the following cipher suites:

- TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256

2.1.3 Client Authenticity

Conformant KMIP servers and clients SHALL handle client authenticity in accordance with section 3.2.3 of the TLS 1.2 Authentication Suite [KMIP-PROF].

2.1.4 Object Owner

Conformant KMIP servers and clients SHALL handle object owner in accordance with section 3.2.4 of the TLS 1.2 Authentication Suite [KMIP-PROF].

2.1.5 KMIP Port Number

Conformant KMIP servers and clients SHALL handle the KMIP port number in accordance with section 3.2.5 of the TLS 1.2 Authentication Suite [KMIP-PROF].

2.2 Suite B minLOS_128 - Client

KMIP clients conformant to this profile under [KMIP-SPEC-1_0]:

1. SHALL conform to the [KMIP-SPEC-1_0]

KMIP clients conformant to this profile under [KMIP-SPEC-1_1]:

1.2 SHALL conform to the Baseline Client conformance clauses in Clause (section 5.12) of [KMIP-PROF] and [KMIP-SPEC-1_1]

KMIP clients conformant to this profile under [KMIP-SPEC-1_2]:

3. SHALL conform to the Baseline Client (section 5.2) of [KMIP-PROF-1_2]

KMIP clients conformant to this profile:

2.4 SHALL restrict use of the enumerated types listed in item 86 of the server list below in section 2.3 to the values noted against each item

5. MAY support any clause within [KMIP-SPEC] provided it does not conflict with any other clause within this section 2.2.
6. MAY support extensions outside the scope of this standard (e.g., vendor extensions, conformance clauses) that do not conflict with any KMIP or [CNSSP-15] requirements.

2.3 Suite B minLOS_128 MAY support any clause within [KMIP-SPEC] provided it does not conflict with any other clause within this section - Server

2.1 MAY support extensions outside the scope of this standard (e.g., vendor extensions, conformance clauses) that do not conflict with any KMIP or [CNSSP-15] requirements.

KMIP servers conformant to this profile under [KMIP-SPEC-1_0]:

1. SHALL conform to the [KMIP-SPEC-1_0]

KMIP servers conformant to this profile under [KMIP-SPEC-1_1]:

3.2 SHALL conform to the Baseline Server profile in [KMIP-PROF] and [KMIP-SPEC-1_1]

KMIP servers conformant to this profile under [KMIP-SPEC-1_2]:

3. SHALL conform to the Baseline Server of [KMIP-PROF-1_2]

KMIP servers conformant to this profile:

4. SHALL support the following Objects [KMIP-SPEC]
   a. Certificate [KMIP-SPEC]
   b. Symmetric Key [KMIP-SPEC]
   c. Public Key [KMIP-SPEC]
   d. Private Key [KMIP-SPEC]

5. SHALL support the following Attributes [KMIP-SPEC]
   a. Cryptographic Algorithm [KMIP-SPEC]
   b. Cryptographic Length [KMIP-SPEC] value:
      i. 128-bit (combined with AES)
      ii. 256-bit (combined with SHA, ECDH or ECDSA)

6. MAY support the following Attributes [KMIP-SPEC]
   a. Cryptographic Length [KMIP-SPEC] value:
      i. 256-bit (combined with AES)
      ii. 384-bit bit (combined with SHA, ECDH or ECDSA)

7. SHALL support the following Client-to-Server Operations [KMIP-SPEC]:
   a. Create [KMIP-SPEC]
   b. Create Key Pair [KMIP-SPEC]
   c. Register [KMIP-SPEC]
   d. Re-key [KMIP-SPEC]
   e. Re-key Key Pair [KMIP-SPEC]

8. SHALL support the following Message Encoding [KMIP-SPEC]:
   a. Recommended Curve Enumeration [KMIP-SPEC] value:
      i. P-256 (SECP256R1)
   b. Certificate Type Enumeration [KMIP-SPEC] value:
      i. X.509
   c. Cryptographic Algorithm Enumeration [KMIP-SPEC] value:
      i. AES
ii. ECDSA

iii. ECDH

iv. HMAC-SHA256

d. **Hashing Algorithm Enumeration** [KMIP-SPEC]
   i. SHA-256

e. **Object Type Enumeration** [KMIP-SPEC] value:
   i. Certificate
   ii. Symmetric Key
   iii. Public Key
   iv. Private Key

f. **Key Format Type Enumeration** [KMIP-SPEC] value:
   i. Raw
   ii. ECPrivateKey
   iii. X.509
   iv. Transparent ECDSA Private Key
   v. Transparent ECDSA Public Key
   vi. Transparent ECDH Private Key
   vii. Transparent ECDH Public Key

g. **Digital Signature Algorithm Enumeration** [KMIP-SPEC] value:
   i. ECDSA with SHA256 (on P-256)

9. MAY support the following **Message Encoding** [KMIP-SPEC]:
   a. **Recommended Curve** [KMIP-SPEC] value:
      i. P-384 (SECP384R1)
   b. **Cryptographic Algorithm Enumeration** [KMIP-SPEC] value:
      i. HMAC-SHA384
   c. **Hashing Algorithm Enumeration** [KMIP-SPEC]
      i. SHA-384
   d. Digital Signature Algorithm Enumeration
      i. ECDSA with SHA384 (on P-384)

10. MAY support any clause within [KMIP-SPEC] provided it does not conflict with any other clause within this section 2.3.

11. MAY support extensions outside the scope of this standard (e.g., vendor extensions, conformance clauses) that do not conflict with any KMIP or [CNSSP-15] requirements.

3. SHALL support the returning results in accordance with the test cases.

4.1. **Suite B minOS** MAY support any clause within [KMIP-SPEC] provided it does not conflict with any other clause within this section 2.2.

4.1. MAY support extensions outside the scope of this standard (e.g., vendor extensions, conformance clauses) that do not conflict with any KMIP or [CNSSP-15] requirements.
3 Suite B minLOS_128 Test Cases

The test cases define a number of request-response pairs for KMIP operations. Each test case is provided in the XML format specified in [KMIP-ENCODE] intended to be both human-readable and usable by automated tools. The time sequence (starting from 0) for each request-response pair is noted and line numbers are provided for ease of cross-reference for a given test sequence.

Each test case has a unique label (the section name) which includes indication of mandatory (-M-) or optional (-O-) status and the protocol version major and minor numbers as part of the identifier.

The test cases may depend on a specific configuration of a KMIP client and server being configured in a manner consistent with the test case assumptions.

Where possible the flow of unique identifiers between tests, the date-time values, and other dynamic items are indicated using symbolic identifiers – in actual request and response messages these dynamic values will be filled in with valid values.

Note: the values for the returned items and the custom attributes are illustrative. Actual values from a real client or server system may vary as specified in section 6.10

3.1 Mandatory Suite B minLOS_128 Test Cases KMIP 1.0

This section documents the test cases that a client or server conformant to this profile SHALL support.

3.1.1 SUITEB_128-M-1-10 - Query

Perform a Query operation, querying the Operations and Objects supported by the server, and get a successful response.

The specific list of operations and object types returned in the response MAY vary.

The TLS protocol version and cipher suite SHALL be as specified in section 2.1

```
# TIME 0
0001  <RequestMessage>
0002    <RequestHeader>
0003      <ProtocolVersion>
0004        <ProtocolVersionMajor type="Integer" value="1"/>
0005        <ProtocolVersionMinor type="Integer" value="0"/>
0006      </ProtocolVersion>
0007      <BatchCount type="Integer" value="1"/>
0008    </RequestHeader>
0009    <BatchItem>
0010      <Operation_type="Enumeration" value="Query"/>
0011      <RequestPayload>
0012        <QueryFunction type="Enumeration" value="QueryOperations"/>
0013        <QueryFunction type="Enumeration" value="QueryObjects"/>
0014      </RequestPayload>
0015    </BatchItem>
0016  </RequestMessage>
0017  <ResponseMessage>
0018    <ResponseHeader>
0019      <ProtocolVersion>
0020        <ProtocolVersionMajor type="Integer" value="1"/>
0021        <ProtocolVersionMinor type="Integer" value="0"/>
0022      </ProtocolVersion>
0023      <TimeStamp type="DateTime" value="2013-06-26T09:09:17+00:00"/>
0024      <BatchCount type="Integer" value="1"/>
0025    </ResponseHeader>
```
3.2 Mandatory Suite B minLOS 128 Test Cases KMIP 1.1

3.2.1 SUITEB_128-M-1-11 - Query

Perform a Query operation, querying the Operations and Objects supported by the server, and get a successful response.

The specific list of operations and object types returned in the response MAY vary.

The TLS protocol version and cipher suite SHALL be as specified in section 2.1.
```
<RequestMessage>
  <RequestHeader>
    <ProtocolVersion>
      <ProtocolVersionMajor type="Integer" value="1"/>
      <ProtocolVersionMinor type="Integer" value="1"/>
    </ProtocolVersion>
    <TimeStamp type="DateTime" value="2014-06-11T09:22:39+00:00"/>
  </RequestHeader>
  <RequestPayload>
    <Operation type="Enumeration" value="Query"/>
    <Operation type="Enumeration" value="QueryOperations"/>
    <Operation type="Enumeration" value="QueryObjects"/>
  </RequestPayload>
</RequestMessage>

<ResponseMessage>
  <ResponseHeader>
    <ProtocolVersion>
      <ProtocolVersionMajor type="Integer" value="1"/>
      <ProtocolVersionMinor type="Integer" value="1"/>
    </ProtocolVersion>
    <TimeStamp type="DateTime" value="2014-06-11T09:22:39+00:00"/>
  </ResponseHeader>
  <ResponsePayload>
    <Operation type="Enumeration" value="Query"/>
    <ResultStatus type="Enumeration" value="Success"/>
    <Operation type="Enumeration" value="Locate"/>
    <Operation type="Enumeration" value="Destroy"/>
    <Operation type="Enumeration" value="Get"/>
    <Operation type="Enumeration" value="Create"/>
    <Operation type="Enumeration" value="Register"/>
    <Operation type="Enumeration" value="GetAttributes"/>
    <Operation type="Enumeration" value="GetAttributeList"/>
    <Operation type="Enumeration" value="AddAttribute"/>
    <Operation type="Enumeration" value="ModifyAttribute"/>
    <Operation type="Enumeration" value="DeleteAttribute"/>
    <Operation type="Enumeration" value="Activate"/>
    <Operation type="Enumeration" value="Revoke"/>
    <Operation type="Enumeration" value="Poll"/>
    <Operation type="Enumeration" value="Cancel"/>
    <Operation type="Enumeration" value="Check"/>
    <Operation type="Enumeration" value="GetUsageAllocation"/>
    <Operation type="Enumeration" value="CreateKeyPair"/>
    <Operation type="Enumeration" value="ReKey"/>
    <Operation type="Enumeration" value="Archive"/>
    <Operation type="Enumeration" value="Recover"/>
    <Operation type="Enumeration" value="ObtainLease"/>
    <Operation type="Enumeration" value="ReKeyKeyPair"/>
    <Operation type="Enumeration" value="Certify"/>
    <Operation type="Enumeration" value="ReCertify"/>
    <Operation type="Enumeration" value="DiscoverVersions"/>
    <Operation type="Enumeration" value="Notify"/>
    <Operation type="Enumeration" value="Put"/>
    <ObjectType type="Enumeration" value="Certificate"/>
    <ObjectType type="Enumeration" value="SymmetricKey"/>
    <ObjectType type="Enumeration" value="SecretData"/>
    <ObjectType type="Enumeration" value="PublicKey"/>
    <ObjectType type="Enumeration" value="PrivateKey"/>
  </ResponsePayload>
</ResponseMessage>
```
3.3 Mandatory Suite B minLOS 128 Test Cases KMIP 1.2

3.3.1 SUITEB 128-M-1-12 - Query

Perform a Query operation, querying the Operations and Objects supported by the server, and get a successful response.

The specific list of operations and object types returned in the response MAY vary.

The TLS protocol version and cipher suite SHALL be as specified in section 2.1N/A

```xml
<RequestMessage>
  <RequestHeader>
    <ProtocolVersion>
      <ProtocolVersionMajor type="Integer" value="1"/>
      <ProtocolVersionMinor type="Integer" value="2"/>
    </ProtocolVersion>
    <BatchCount type="Integer" value="1"/>
  </RequestHeader>
  <BatchItem>
    <Operation type="Enumeration" value="Query"/>
    <RequestPayload>
      <QueryFunction type="Enumeration" value="QueryOperations"/>
      <QueryFunction type="Enumeration" value="QueryObjects"/>
    </RequestPayload>
  </BatchItem>
</RequestMessage>

<ResponseMessage>
  <ResponseHeader>
    <ProtocolVersion>
      <ProtocolVersionMajor type="Integer" value="1"/>
      <ProtocolVersionMinor type="Integer" value="2"/>
    </ProtocolVersion>
    <TimeStamp type="DateTime" value="2014-06-11T09:23:21+00:00"/>
    <BatchCount type="Integer" value="1"/>
  </ResponseHeader>
  <BatchItem>
    <Operation type="Enumeration" value="Query"/>
    <ResultStatus type="Enumeration" value="Success"/>
    <ResponsePayload>
      <Operation type="Enumeration" value="Query"/>
      <Operation type="Enumeration" value="Locate"/>
      <Operation type="Enumeration" value="Destroy"/>
      <Operation type="Enumeration" value="Get"/>
      <Operation type="Enumeration" value="Create"/>
      <Operation type="Enumeration" value="Register"/>
      <Operation type="Enumeration" value="GetAttributes"/>
      <Operation type="Enumeration" value="GetAttributeList"/>
      <Operation type="Enumeration" value="AddAttribute"/>
      <Operation type="Enumeration" value="ModifyAttribute"/>
    </ResponsePayload>
  </BatchItem>
</ResponseMessage>
```
<Operation type="Enumeration" value="DeleteAttribute"/>
<Operation type="Enumeration" value="Activate"/>
<Operation type="Enumeration" value="Revoke"/>
<Operation type="Enumeration" value="Poll"/>
<Operation type="Enumeration" value="Cancel"/>
<Operation type="Enumeration" value="Check"/>
<Operation type="Enumeration" value="GetUsageAllocation"/>
<Operation type="Enumeration" value="CreateKeyPair"/>
<Operation type="Enumeration" value="ReKey"/>
<Operation type="Enumeration" value="Archive"/>
<Operation type="Enumeration" value="Recover"/>
<Operation type="Enumeration" value="ObtainLease"/>
<Operation type="Enumeration" value="ReKeyKeyPair"/>
<Operation type="Enumeration" value="Certify"/>
<Operation type="Enumeration" value="ReCertify"/>
<Operation type="Enumeration" value="DiscoverVersions"/>
<Operation type="Enumeration" value="Notify"/>
<Operation type="Enumeration" value="Put"/>
<Operation type="Enumeration" value="RNGRetrieve"/>
<Operation type="Enumeration" value="RNGSeed"/>
<Operation type="Enumeration" value="Encrypt"/>
<Operation type="Enumeration" value="Decrypt"/>
<Operation type="Enumeration" value="Sign"/>
<Operation type="Enumeration" value="SignatureVerify"/>
<Operation type="Enumeration" value="MAC"/>
<Operation type="Enumeration" value="MACVerify"/>
<Operation type="Enumeration" value="Hash"/>
<Operation type="Enumeration" value="CreateSplitKey"/>
<Operation type="Enumeration" value="JoinSplitKey"/>
<ObjectType type="Enumeration" value="Certificate"/>
<ObjectType type="Enumeration" value="SymmetricKey"/>
<ObjectType type="Enumeration" value="SecretData"/>
<ObjectType type="Enumeration" value="PublicKey"/>
<ObjectType type="Enumeration" value="PrivateKey"/>
<ObjectType type="Enumeration" value="Template"/>
<ObjectType type="Enumeration" value="OpaqueObject"/>
<ObjectType type="Enumeration" value="SplitKey"/>
<ObjectType type="Enumeration" value="PGPKey"/>
</ResponsePayload>
</BatchItem>
</ResponseMessage>
4 Suite B minLOS_192 Profile

The Suite B minLOS_192 Profile describes a KMIP client interacting with a KMIP server as an information assurance product to provide a minimum level of security of 192 bits. (http://www.nsa.gov/ia/programs/suiteb_cryptography/)

4.1 Authentication Suite

Implementations conformant to this profile SHALL use TLS to negotiate a mutually-authenticated connection.

4.1.1 Protocols

Conformant KMIP clients and servers SHALL support:

- TLS v1.2 [RFC5246]

4.1.2 Cipher Suites

Conformant KMIP servers SHALL support the following cipher suites:

- TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384

4.1.3 Client Authenticity

Conformant KMIP servers and clients SHALL handle client authenticity in accordance with section 3.2.3 of the TLS 1.2 Authentication Suite [KMIP-PROF].

4.1.4 Object Owner

Conformant KMIP servers and clients SHALL handle object owner in accordance with section 3.2.4 of the TLS 1.2 Authentication Suite [KMIP-PROF].

4.1.5 KMIP Port Number

Conformant KMIP servers and clients SHALL handle the KMIP port number in accordance with section 3.2.5 of the TLS 1.2 Authentication Suite [KMIP-PROF].

4.2 Suite B minLOS_192 - Client

KMIP clients conformant to this profile under [KMIP-SPEC-1_0]:

1. SHALL conform to the [KMIP-SPEC-1_0]

KMIP clients conformant to this profile under [KMIP-SPEC-1_1]:

- 1.2 SHALL conform to the Baseline Client conformance clauses in Clause (section 5.12) of [KMIP-PROF] and [KMIP-SPEC-1_1]

KMIP clients conformant to this profile under [KMIP-SPEC-1_2]:

3. SHALL conform to the Baseline Client (section 5.2) of [KMIP-PROF-1_2]

KMIP clients conformant to this profile under [KMIP-SPEC]:

- 2.4 SHALL restrict use of the enumerated types listed in item 75 of the server list below in section 4.3 to the values noted against each item

- 3.5 MAY support any clause within [KMIP-SPEC] provided it does not conflict with any other clause within this section 4.2.
4.6. MAY support extensions outside the scope of this standard (e.g., vendor extensions, conformance clauses) that do not conflict with any KMIP or [CNSSP-15] requirements.

4.3 Suite B minLOS_192 - Server

KMIP servers conformant to this profile under [KMIP-SPEC-1_0]:

1. SHALL conform to the [KMIP-SPEC-1_0]

2. KMIP servers conformant to this profile under [KMIP-SPEC-1_1]:

1.2. SHALL conform to the Baseline Server profile in of [KMIP-PROF] and [KMIP-SPEC] and-1_1

3. KMIP servers conformant to this profile under [KMIP-SPEC-1_2]:

KMIP servers conformant to this profile under [KMIP-SPEC]:

2.4. SHALL support the following Objects [KMIP-SPEC]

a. Certificate [KMIP-SPEC]

b. Symmetric Key [KMIP-SPEC]

c. Public Key [KMIP-SPEC]

d. Private Key [KMIP-SPEC]

3.5. SHALL support the following Attributes [KMIP-SPEC]

e. Cryptographic Algorithm [KMIP-SPEC]

f. Cryptographic Length [KMIP-SPEC] value:

i. 384-bit bit (combined with SHA, ECDH or ECDSA)

4.6. SHALL support the following Client-to-Server Operations [KMIP-SPEC]:

g. Create [KMIP-SPEC]

h. Create Key Pair [KMIP-SPEC]

i. Register [KMIP-SPEC]

j. Re-key [KMIP-SPEC]

k. Re-key Key Pair [KMIP-SPEC]

5.7. SHALL support the following Message Encoding [KMIP-SPEC]:

l. Recommended Curve Enumeration [KMIP-SPEC] value:

i. P-384 (SECP384R1)

m. Certificate Type Enumeration [KMIP-SPEC] value:

i. X.509

n. Cryptographic Algorithm Enumeration [KMIP-SPEC] value:

i. AES

ii. ECDSA

iii. ECDH

iv. HMAC-SHA384

o. Hashing Algorithm Enumeration [KMIP-SPEC]

i. SHA-384

p. Object Type Enumeration [KMIP-SPEC] value:

i. Certificate

ii. Symmetric Key

iii. Public Key

iv. Private Key
q. **Key Format Type Enumeration** [KMIP-SPEC] value:
   
   i. Raw
   
   ii. ECPrivateKey
   
   iii. X.509
   
   iv. Transparent ECDSA Private Key
   
   v. Transparent ECDSA Public Key
   
   vi. Transparent ECDH Private Key
   
   vii. Transparent ECDH Public Key

r. **Digital Signature Algorithm Enumeration** [KMIP-SPEC] value:

   i. ECDSA with SHA384 (on P-384)

2. SHALL support the returning results in accordance with the test cases.

6-8. MAY support any clause within [KMIP-SPEC] provided it does not conflict with any other clause within this section 4.3.

7-9. MAY support extensions outside the scope of this standard (e.g., vendor extensions, conformance clauses) that do not conflict with any KMIP or [CNSSP-15] requirements.
5 Suite B minLOS_192 Test Cases

The test cases define a number of request-response pairs for KMIP operations. Each test case is provided in the XML format specified in [KMIP-ENCODE] intended to be both human-readable and usable by automated tools. The time sequence (starting from 0) for each request-response pair is noted and line numbers are provided for ease of cross-reference for a given test sequence.

Each test case has a unique label (the section name) which includes indication of mandatory (-M-) or optional (-O-) status and the protocol version major and minor numbers as part of the identifier.

The test cases may depend on a specific configuration of a KMIP client and server being configured in a manner consistent with the test case assumptions.

Where possible the flow of unique identifiers between tests, the date-time values, and other dynamic items are indicated using symbolic identifiers — in actual request and response messages these dynamic values will be filled in with valid values.

Note: the values for the returned items and the custom attributes are illustrative. Actual values from a real client or server system may vary as specified in section 6.10

5.1 Mandatory Suite B minLOS_192 Test Cases - KMIP v1.0

This section documents the test cases that a client or server conformant to this profile SHALL support.

5.1.1 This section documents SUITEB_192-M-1-10 - Query

Perform a Query operation, querying the test cases that a client or server conformant to this profile, and get a successful response.

The specific list of operations and object types returned in the response MAY vary.

The TLS protocol version and cipher suite SHALL support as specified in section 4.1

```
# TIME 0
0001 <RequestMessage>
0002    <RequestHeader>
0003     <ProtocolVersion>
0004      <ProtocolVersionMajor type="Integer" value="1"/>
0005      <ProtocolVersionMinor type="Integer" value="0"/>
0006    </ProtocolVersion>
0007     <BatchCount type="Integer" value="1"/>
0008    </RequestHeader>
0009 <BatchItem>
0010     <Operation type="Enumeration" value="Query"/>
0011     <RequestPayload>
0012      <QueryFunction type="Enumeration" value="QueryOperations"/>
0013      <QueryFunction type="Enumeration" value="QueryObjects"/>
0014     </RequestPayload>
0015   </BatchItem>
0016 </RequestMessage>
```

```
0017 <ResponseMessage>
0018    <ResponseHeader>
0019     <ProtocolVersion>
0020      <ProtocolVersionMajor type="Integer" value="1"/>
0021      <ProtocolVersionMinor type="Integer" value="0"/>
0022    </ProtocolVersion>
0023     <TimeStamp type="DateTime" value="2013-06-26T09:09:17+00:00"/>
0024     <BatchCount type="Integer" value="1"/>
0025    </ResponseHeader>
```
5.2 Mandatory Suite B minLOS_192 Test Cases KMIP 1.1

5.2.1 SUITEB_192-M-1-11 - Query

Perform a Query operation, querying the Operations and Objects supported by the server, and get a successful response.

The specific list of operations and object types returned in the response MAY vary.

The TLS protocol version and cipher suite SHALL be as specified in section 4.1.
```xml
<RequestMessage>
  <RequestHeader>
    <ProtocolVersion>
      <ProtocolVersionMajor type="Integer" value="1"/>
      <ProtocolVersionMinor type="Integer" value="1"/>
    </ProtocolVersion>
    <TimeStamp type="DateTime" value="2014-06-11T09:22:39+00:00"/>
    <BatchCount type="Integer" value="1"/>
  </RequestHeader>
  <BatchItem>
    <Operation type="Enumeration" value="Query"/>
    <ResultStatus type="Enumeration" value="Success"/>
    <ResponsePayload>
      <Operation type="Enumeration" value="Put"/>
      <Operation type="Enumeration" value="Locate"/>
      <Operation type="Enumeration" value="Destroy"/>
      <Operation type="Enumeration" value="Retrieve"/>
      <Operation type="Enumeration" value="Get"/>
      <Operation type="Enumeration" value="Create"/>
      <Operation type="Enumeration" value="Register"/>
      <Operation type="Enumeration" value="GetAttributes"/>
      <Operation type="Enumeration" value="GetAttributeList"/>
      <Operation type="Enumeration" value="AddAttribute"/>
      <Operation type="Enumeration" value="ModifyAttribute"/>
      <Operation type="Enumeration" value="DeleteAttribute"/>
      <Operation type="Enumeration" value="Activate"/>
      <Operation type="Enumeration" value="Revoke"/>
      <Operation type="Enumeration" value="Poll"/>
      <Operation type="Enumeration" value="Cancel"/>
      <Operation type="Enumeration" value="Check"/>
      <Operation type="Enumeration" value="GetUsageAllocation"/>
      <Operation type="Enumeration" value="CreateKeyPair"/>
      <Operation type="Enumeration" value="ReKey"/>
      <Operation type="Enumeration" value="Archive"/>
      <Operation type="Enumeration" value="Recover"/>
      <Operation type="Enumeration" value="ObtainLease"/>
      <Operation type="Enumeration" value="ObtainKeyPair"/>
      <Operation type="Enumeration" value="Certify"/>
      <Operation type="Enumeration" value="ReCertify"/>
      <Operation type="Enumeration" value="DiscoverVersions"/>
      <Operation type="Enumeration" value="Notify"/>
      <Operation type="Enumeration" value="Put"/>
      <Operation type="Enumeration" value="Certificate"/>
      <Operation type="Enumeration" value="SymmetricKey"/>
      <Operation type="Enumeration" value="SecretData"/>
      <Operation type="Enumeration" value="PublicKey"/>
      <Operation type="Enumeration" value="PrivateKey"/>
    </ResponsePayload>
  </BatchItem>
</RequestMessage>
```
### 5.3 Mandatory Suite B minLOS 192 Test Cases KMIP 1.2

#### 5.3.1 SUITEB 192-M-1-12 - Query

Perform a Query operation, querying the Operations and Objects supported by the server, and get a successful response.

The specific list of operations and object types returned in the response MAY vary.

The TLS protocol version and cipher suite SHALL be as specified in section 4.1.

N/A

```xml
<RequestMessage>
  <RequestHeader>
    <ProtocolVersion>
      <ProtocolVersionMajor type="Integer" value="1"/>
      <ProtocolVersionMinor type="Integer" value="2"/>
    </ProtocolVersion>
    <BatchCount type="Integer" value="1"/>
  </RequestHeader>
  <BatchItem>
    <Operation type="Enumeration" value="Query"/>
    <RequestPayload>
      <QueryFunction type="Enumeration" value="QueryOperations"/>
      <QueryFunction type="Enumeration" value="QueryObjects"/>
    </RequestPayload>
  </BatchItem>
</RequestMessage>

<ResponseMessage>
  <ResponseHeader>
    <ProtocolVersion>
      <ProtocolVersionMajor type="Integer" value="1"/>
      <ProtocolVersionMinor type="Integer" value="2"/>
    </ProtocolVersion>
    <TimeStamp type="DateTime" value="2014-06-11T09:23:21+00:00"/>
    <BatchCount type="Integer" value="1"/>
  </ResponseHeader>
  <BatchItem>
    <Operation type="Enumeration" value="Query"/>
    <ResultStatus type="Enumeration" value="Success"/>
    <ResponsePayload>
      <Operation type="Enumeration" value="Query"/>
      <Operation type="Enumeration" value="Locate"/>
      <Operation type="Enumeration" value="Destroy"/>
      <Operation type="Enumeration" value="Get"/>
      <Operation type="Enumeration" value="Create"/>
      <Operation type="Enumeration" value="Register"/>
      <Operation type="Enumeration" value="GetAttributes"/>
      <Operation type="Enumeration" value="GetAttributeList"/>
    </ResponsePayload>
  </BatchItem>
</ResponseMessage>
```
<Operation type="Enumeration" value="AddAttribute"/>
<Operation type="Enumeration" value="ModifyAttribute"/>
<Operation type="Enumeration" value="DeleteAttribute"/>
<Operation type="Enumeration" value="Activate"/>
<Operation type="Enumeration" value="Revoke"/>
<Operation type="Enumeration" value="Poll"/>
<Operation type="Enumeration" value="Cancel"/>
<Operation type="Enumeration" value="Check"/>
<Operation type="Enumeration" value="GetUsageAllocation"/>
<Operation type="Enumeration" value="CreateKeyPair"/>
<Operation type="Enumeration" value="ReKey"/>
<Operation type="Enumeration" value="Archive"/>
<Operation type="Enumeration" value="Recover"/>
<Operation type="Enumeration" value="ObtainLease"/>
<Operation type="Enumeration" value="ReKeyKeyPair"/>
<Operation type="Enumeration" value="Certify"/>
<Operation type="Enumeration" value="ReCertify"/>
<Operation type="Enumeration" value="DiscoverVersions"/>
<Operation type="Enumeration" value="Notify"/>
<Operation type="Enumeration" value="Put"/>
<Operation type="Enumeration" value="RNGRetrieve"/>
<Operation type="Enumeration" value="RNGSeed"/>
<Operation type="Enumeration" value="Encrypt"/>
<Operation type="Enumeration" value="Decrypt"/>
<Operation type="Enumeration" value="Sign"/>
<Operation type="Enumeration" value="SignatureVerify"/>
<Operation type="Enumeration" value="MAC"/>
<Operation type="Enumeration" value="MACVerify"/>
<Operation type="Enumeration" value="Hash"/>
<Operation type="Enumeration" value="CreateSplitKey"/>
<Operation type="Enumeration" value="JoinSplitKey"/>
<ObjectType type="Enumeration" value="Certificate"/>
<ObjectType type="Enumeration" value="SymmetricKey"/>
<ObjectType type="Enumeration" value="SecretData"/>
<ObjectType type="Enumeration" value="PublicKey"/>
<ObjectType type="Enumeration" value="PrivateKey"/>
<ObjectType type="Enumeration" value="Template"/>
<ObjectType type="Enumeration" value="OpaqueObject"/>
<ObjectType type="Enumeration" value="SplitKey"/>
<ObjectType type="Enumeration" value="PGPKey"/>
</ResponsePayload>
</BatchItem>
</ResponseMessage>
6 Conformance

6.1 Suite B minLOS_128 Client KMIP V1.0 Profile Conformance

KMIP client implementations conformant to this profile:

1. SHALL support the Authentication Suite conditions as specified in Section 2.1 of this profile.
2. SHALL support the conditions as specified in Section 2.2 of this profile.
3. SHALL support all the Mandatory Suite B minLOS_128 Test Cases KMIP 1.0 (3.1 and server)

6.2 Suite B minLOS_128 Client KMIP V1.1 Profile Conformance

KMIP client implementations conformant to this profile:

1. SHALL support the Authentication Suite conditions as specified in Section 2.1 of this profile.
2. SHALL support the conditions as specified in Section 2.2 of this profile.
3. Suite B minLOS_192

6.3 Suite B minLOS_128 Client KMIP V1.2 Profile Conformance

KMIP client implementations conformant to this profile:

1. SHALL support the Authentication Suite conditions as specified in Section 2.1 of this profile.
2. SHALL support the conditions as specified in Section 2.2 of this profile.
3. SHALL support all the Mandatory Suite B minLOS_128 Test Cases KMIP 1.1 (3.2)

6.4 Suite B minLOS_128 Server KMIP V1.0 Profile Conformance

KMIP server implementations conformant to this profile:

1. SHALL support the Authentication Suite conditions as specified in Section 2.1 of this profile.
2. SHALL support the conditions as specified in Section 2.3 of this profile.
3. SHALL support all the Mandatory Suite B minLOS_128 Test Cases KMIP 1.0 (3.1)

6.5 Suite B minLOS_128 Server KMIP V1.1 Profile Conformance

KMIP server implementations conformant to this profile:

1. SHALL support the Authentication Suite conditions as specified in Section 2.1 of this profile.
2. SHALL support the conditions as specified in Section 2.3 of this profile.
3. SHALL support all the Mandatory Suite B minLOS_128 Test Cases KMIP 1.1 (3.2)

6.6 Suite B minLOS_128 Server KMIP V1.2 Profile Conformance

KMIP server implementations conformant to this profile:

1. SHALL support the Authentication Suite conditions as specified in Section 2.1 of this profile.
2. SHALL support the conditions as specified in Section 2.3 of this profile.
3. SHALL support all the Mandatory Suite B minLOS_128 Test Cases KMIP 1.2 (3.3)

6.7 Suite B minLOS_192 Client KMIP V1.0 Profile Conformance

KMIP client implementations conformant to this profile:
1. SHALL support the Authentication Suite conditions as specified in Section 4.1 of this profile.
2. SHALL support the conditions as specified in Section 4.2 of this profile.
3. SHALL support all the Mandatory Suite B minLOS_192 Test Cases - KMIP v1.0 (5.1)

6.8 Suite B minLOS_192 Client KMIP V1.1 Profile Conformance

KMIP client implementations conformant to this profile:
1. SHALL support the Authentication Suite conditions as specified in Section 4.1 of this profile.
2. SHALL support the conditions as specified in Section 4.2 of this profile.
3. SHALL support all the Mandatory Suite B minLOS_192 Test Cases KMIP 1.1(5.2)

6.9 Suite B minLOS_192 Client KMIP V1.2 Profile Conformance

KMIP client implementations conformant to this profile:
1. SHALL support the Authentication Suite conditions as specified in Section 4.1 of this profile.
2. SHALL support the conditions as specified in Section 4.2 of this profile.
3. SHALL support all the Mandatory Suite B minLOS_192 Test Cases KMIP 1.2 (5.3)

6.10 Suite B minLOS_192 Server KMIP V1.0 Profile Conformance

KMIP server implementations conformant to this profile:
1. SHALL support the Authentication Suite conditions as specified in Section 4.1 of this profile.
2. SHALL support the conditions as specified in Section 4.3 of this profile.
3. SHALL support all the Mandatory Suite B minLOS_192 Test Cases - KMIP v1.0 (5.1)

6.11 Suite B minLOS_192 Server KMIP V1.1 Profile Conformance

KMIP server implementations conformant to this profile:
1. SHALL support the Authentication Suite conditions as specified in Section 4.1 of this profile.
2. SHALL support the conditions as specified in Section 4.3 of this profile.
3. SHALL support all the Mandatory Suite B minLOS_192 Test Cases KMIP 1.1(5.2)

6.12 Suite B minLOS_192 Server KMIP V1.2 Profile Conformance

KMIP server implementations conformant to this profile:
1. SHALL support the Authentication Suite conditions as specified in Section 4.1 of this profile.
2. SHALL support the conditions as specified in Section 4.3 of this profile.
3. SHALL support all the Mandatory Suite B minLOS_192 Test Cases KMIP 1.2 (5.3)

6.36.13 Permitted Test Case Variations

Whilst the test cases provided in this Profile define the allowed request and response content, some inherent variations MAY occur and are permitted within a successfully completed test case.
Each test case MAY include allowed variations in the description of the test case in addition to the variations noted in this section.
Other variations not explicitly noted in this Profile SHALL be deemed non-conformant.

6.3.16.13.1 Variable Items

An implementation conformant to this Profile MAY vary the following values:
1. UniqueIdentifier
2. PrivateKeyUniqueIdentifier
3. PublicKeyUniqueIdentifier
4. UniqueBatchItemIdentifier
5. AsynchronousCorrelationValue
6. TimeStamp
7. KeyValue / KeyMaterial including:
   a. key material content returned for managed cryptographic objects which are generated by the server
   b. wrapped versions of keys where the wrapping key is dynamic or the wrapping contains variable output for each wrap operation
8. For response containing the output of cryptographic operation in Data / SignatureData/ MACData / IVCounterNonce where:
   a. the managed object is generated by the server; or
   b. the operation inherently contains variable output
9. For the following DateTime attributes where the value is not specified in the request as a fixed DateTime value:
   a. ActivationDate
   b. ArchiveDate
   c. CompromiseDate
   d. CompromiseOccurrenceDate
   e. DeactivationDate
   f. DestroyDate
   g. InitialDate
   h. LastChangeDate
   i. ProtectStartDate
   j. ProcessStopDate
   k. ValidityDate
   l. OriginalCreationDate
10. LinkedObjectIdentifier
11. DigestValue
   a. For those managed cryptographic objects which are dynamically generated
12. KeyFormatType
   a. The key format type selected by the server when it creates managed objects
13. Digest
   a. The HashingAlgorithm selected by the server when it calculates the digest for a managed object for which it has access to the key material
   b. The Digest Value
14. Extensions reported in Query for ExtensionList and ExtensionMap
15. Application Namespaces reported in Query
16. Object Types reported in Query other than those noted as required in this profile
17. Operation Types reported in Query other than those noted as required in this profile (or any referenced profile documents)
18. For TextString attribute values containing test identifiers:
a. Additional vendor or application prefixes

19. Additional attributes beyond those noted in the response

An implementation conformant to this Profile MAY allow the following response variations:

20. Object Group values – May or may not return one or more Object Group values not included in the requests

21. y-CustomAttributes – May or may not include additional server-specific associated attributes not included in requests

22. Message Extensions – May or may not include additional (non-critical) vendor extensions

23. TemplateAttribute – May or may not be included in responses where the Template Attribute response is noted as optional in [KMIP-SPEC]

24. AttributeIndex – May or may not include Attribute Index value where the Attribute Index value is 0 for Protocol Versions 1.1 and above.

25. ResultMessage – May or may not be included in responses and the value (if included) may vary from the text contained within the test case.

26. The list of Protocol Versions returned in a DiscoverVersion response may include additional protocol versions if the request has not specified a list of client supported Protocol Versions.

27. VendorIdentification - The value (if included) may vary from the text contained within the test case.

6.3.26.13.2 Variable behavior

An implementation conformant to this Profile SHALL allow variation of the following behavior:

1. A test may omit the clean-up requests and responses (containing Revoke and/or Destroy) at the end of the test provided there is a separate mechanism to remove the created objects during testing.

2. A test may omit the test identifiers if the client is unable to include them in requests. This includes the following attributes:
   a. Name; and
   b. x-ID

3. A test MAY perform requests with multiple batch items or as multiple requests with a single batch item provided the sequence of operations are equivalent

4. A request MAY contain an optional Authentication [KMIP_SPEC] structure within each request
Appendix A. Acknowledgments

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Participants:

517    Hal Aldridge, Sypris Electronics
518    Mike Allen, Symantec
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520    Todd Arnold, IBM
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522    Lars Bagnert, PrimeKey
523    Elaine Barker, NIST
524    Peter Bartok, Venafi, Inc.
525    Tom Benjamin, IBM
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529    Anne Bolgert, IBM
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531    Tim Bruce, CA Technologies
532    Chris Burchett, Credant Technologies, Inc.
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540    Tony Cox, Cryptsoft
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545    Michael Duren, Sypris Electronics
546    James Dzierzanowski, American Express CCoE
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548    Stan Feather, Hewlett-Packard
549    David Finkelstein, Symantec Corp.
550    James Fitzgerald, SafeNet, Inc.
551    Indra Fitzgerald, Hewlett-Packard
552    Judith Furlong, EMC Corporation
553    Susan Gleeson, Oracle
554    Robert Griffin, EMC Corporation
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564    Tim Hudson, Cryptsoft
565    Jonas Iggbom, Venafi, Inc.
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Mark Knight, Thales e-Security
Kathy Kriese, Symantec Corporation
Mark Lambiase, SecureAuth
John Leiseboer, Quintessence Labs
Hal Lockhart, Oracle Corporation
Robert Lockhart, Thales e-Security
Anne Luk, Cryptsoft
Sairam Manidi, Freescale
Luther Martin, Voltage Security
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Michael Stevens, QuintessenceLabs
Marcus Streets, Thales e-Security
Satish Sundar, IBM
Kiran Thota, VMware
Somanchi Trinath, Freescale Semiconductor, Inc.
Nathan Turajski, Thales e-Security
Sean Turner, IECA, Inc.
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Steven Wierenga, Hewlett-Packard
Jin Wong, QuintessenceLabs
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Peter Yee, EMC Corporation
Krishna Yellepeddy, IBM
Catherine Ying, SafeNet, Inc.
Tatu Ylonen, SSH Communications Security (Tectia Corp)
<table>
<thead>
<tr>
<th>Line</th>
<th>Name</th>
<th>Company</th>
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<tbody>
<tr>
<td>623</td>
<td>Michael Yoder</td>
<td>Vormetric. Inc.</td>
</tr>
<tr>
<td>624</td>
<td>Magda Zdunkiewicz</td>
<td>Cryptsoft</td>
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<tr>
<td>625</td>
<td>Peter Zelechoski</td>
<td>Election Systems &amp; Software</td>
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## Appendix B. KMIP Specification Cross Reference

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### 5 Server-to-Client Operations

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### 6 Message Contents

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### 8 Authentication

#### Authentication

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| Attestation Type Enumeration | - | - | 9.1.3.2.36.
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| Derivation Method Enumeration | 9.1.3.2.20. | 9.1.3.2.21. | 9.1.3.2.21.
| Digital Signature Algorithm Enumeration | - | 9.1.3.2.7. | 9.1.3.2.7.
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| Key Format Type Enumeration | 9.1.3.2.3. | 9.1.3.2.3. | 9.1.3.2.3.
| Key Role Type Enumeration | 9.1.3.2.16. | 9.1.3.2.17. | 9.1.3.2.17.
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### 10 Transport

| Transport | 10 | 10 | 10 |

### 12 KMIP Server and Client Implementation Conformance

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| KMIP Client Implementation Conformance | -    | 12.2. | 12.2. |
| KMIP Server Implementation Conformance | -    | 12.1. | 12.1. |
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<td>wd01</td>
<td>10 July 2013</td>
<td>Kelley Burgin / Tim Hudson</td>
<td>Initial Draft</td>
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<tr>
<td>wd02</td>
<td>8 August 2013</td>
<td>Kelley Burgin</td>
<td>Editorial updates and inclusion of a corresponding restriction on client enumeration usage</td>
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<td>wd03</td>
<td>10 August 2013</td>
<td>Tim Hudson</td>
<td>Updated Permitted Test Case Variations</td>
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<td>wd03a</td>
<td>24-October-2013</td>
<td>Tim Hudson</td>
<td>Editorial update to include VendorIdentification in the list of allowed variations as per TC motion.</td>
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<td>pr01update</td>
<td>11-June-2014</td>
<td>Tim Hudson</td>
<td>Updated following Public Review</td>
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