Digital Imaging and Communications in Medicine (DICOM)

Supplement 230: Update BCP Secure Communications Profiles

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Table of Contents

Scope and Field of Application

This Supplement adds two new Secure Transport Connection Profiles and retires several others.

The IETF recently updated the Best Current Practice document called BCP-195. The new document no longer allows downgrading to TLS 1.0 or 1.1, which necessitates DICOM retiring Secure Transport Connection Profiles that are based on those protocols. The new version of BCP-195 is more in line with DICOM's B.10 Non-Downgrading BCP 195 Secure Transport Connection Profile.

In addition, the Japanese government has modified their guidelines for "high-security type" devices, hence the old Extended BCP 195 profile (B.11) is also now out of date, needs to be retired, and a new profile created that reflects the new revisions.

Part 2

Modify Section A.8.4.2 Secure Transport Connection Profiles, as modified by Supplement 209, as shown

A.8.4.2 Secure Transport Connection Profiles

*[In Table **Error! No text of specified style in document.**-1 below, all the Profiles not supported can be deleted. But it is also permitted to keep them for transparency reasons and mark them with "N".*

In the "Secured AE" column list the AEs that support the Profile (use ALL if all AEs support it, ALL EXCEPT to provide an exception list). In the "Sender" and "Receiver" columns, describe if the Profile is supported or not using Y or N.]

*Table **Error! No text of specified style in document.**-1* describes the Secure Transport Connection Profiles supported by the product. Accepted cipher suites are described in the section listed in the "Reference" column.

Table Error! No text of specified style in document.**-1: Secure Transport Connection Profiles**

Profile	Secured AE	Sender	Receiver	Reference
~~**BCP195 TLS Secure Transport Connection**~~ **BCP 195 RFC 8996 TLS Secure Transport Connection Profile**				0
~~**Non-Downgrading BCP195 TLS Secure Transport Connection**~~ **Modified BCP 195 RFC 8996 TLS Secure Transport Connection Profile**				0
~~**Extended BCP195 TLS Secure Transport Connection**~~				~~**0**~~
[Any additional or retired TLS Profile]				

Modify Section A,11.2.5 A.C.2.5 Secure Transport Connection Details, as modified by Supplement 209, as shown

A,11.2.5 A.C.2.5 Secure Transport Connection Details

Table A.11.2.5-1 lists the secure transport connection profiles and cipher suites supported for TLS 3.0:

[In the table below, add any Profile claimed in Section 0, Modify Section A.8.4.2 *Secure Transport Connection Profiles, as modified by Supplement 209, as shown*

*A.8.4.2 Secure Transport Connection Profiles****. For each Profile, list all TLS 3.0 Cipher suites supported by your product and fill in the "Default Preference Order" column if applicable.]***

Table Error! No text of specified style in document..**2.5-1:Secure Transport Connection Profiles and TLS 3.0 Cipher Suites**

Profile	Cipher Suite	Default Preference Order (from 1=preferred to n=less preferred)
Modified BCP 195 RFC 8996 TLS Secure Transport Connection Profile	***TLS_AES_256_GCM_SHA384***	
	TLS_CHACHA20_POLY1305_SHA256	
	TLS_AES_128_GCM_SHA256	
	TLS_AES_128_CCM_SHA256	
	TLS_AES_128_CCM_8_SHA256	
[Any TLS Profile supported by <product>]	***[Any Cypher suite]***	

Table A.11.2.5-2 lists the secure transport connection profiles and key exchange algorithms supported for TLS 3.0:

[In the table below, add any Profile claimed in Section 0, Modify Section A.8.4.2 *Secure Transport Connection Profiles, as modified by Supplement 209, as shown*

*A.8.4.2 Secure Transport Connection Profiles****. For each Profile, list all TLS 3.0 key exchange algorithms supported by your product and fill in the "Default Preference Order" column if applicable.]***

Table Error! No text of specified style in document..**2.5-2:Secure Transport Connection Profiles and TLS 3.0 Key Exchange Algorithms**

Profile	Key Exchange Algorithm	Default Preference Order

		(from 1=preferred to n=less preferred)
Modified BCP 195 RFC 8996 TLS Secure Transport Connection Profile	***ECDHE***	
	DHE	
[Any TLS Profile supported by <product>]	***[Any key exchange algorithm]***	

Table A.11.2.5-3 lists the secure transport connection profiles and signature algorithms supported for TLS 3.0:

[In the table below, add any Profile claimed in Section 0, Modify Section A.8.4.2 *Secure Transport Connection Profiles, as modified by Supplement 209, as shown*

*A.8.4.2 Secure Transport Connection Profiles****. For each Profile, list all TLS 3.0 signature algorithms supported by your product and fill in the "Default Preference Order" column if applicable.]***

Table Error! No text of specified style in document..**2.5-3:Secure Transport Connection Profiles and TLS 3.0 Signature Algorithms**

Profile	**Signature Algorithm**	**Default Preference Order (from 1=preferred to n=less preferred)**
Modified BCP 195 RFC 8996 TLS Secure Transport Connection Profile	***ECDSA***	
	RSASSA PKCS#1 v1.5 (RSA)	
	RSASSA-PSS	
[Any TLS Profile supported by <product>]	***[Any signature algorithm]***	

Table **Error! No text of specified style in document.**-1 lists the secure transport connection profiles and cipher suites supported **for TLS 2.0**:

~~[Describe here the mechanisms and tools that are supported by the implementation for Certificate Distribution, Certificate Validation and Key Management.]~~

[In the table below, add any Profile claimed in Section 0, Modify Section A.8.4.2 Secure Transport Connection Profiles, as modified by Supplement 209, as shown

A.8.4.2 Secure Transport Connection Profiles. For each Profile, list all ***TLS 2,0*** *Cipher suites supported by your product and fill in the "Default Preference Order" column if applicable.]*

Table Error! No text of specified style in document.**-1:Secure Transport Connection Profiles and TLS 2.0 Cipher Suites**

Profile	Cipher Suite	Default Preference Order (from 1=preferred to n=less preferred)
~~***Non-Downgrading BCP195 TLS Secure Transport Connection***~~ ***Modified BCP 195 RFC 8996 TLS Secure Transport Connection Profile***	~~***TLS_DHE_RSA_WITH_AES_128_GCM_SHA256***~~	
	TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384	
	TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384	
	TLS_ECDHE_ECDSA_WITH_CAMELLIA_256_GCM_SHA384	
	TLS_ECDHE_RSA_WITH_CAMELLIA_256_GCM_SHA384	
	TLS_ECDHE_ECDSA_WITH_AES_256_CCM	
	TLS_ECDHE_ECDSA_WITH_AES_256_CCM_8	
	TLS_ECDHE_ECDSA_WITH_CHACHA20_POLY1305_SHA256	
	TLS_ECDHE_RSA_WITH_CHACHA20_POLY1305_SHA256	
	TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256	
	TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256	
	TLS_ECDHE_ECDSA_WITH_CAMELLIA_128_GCM_SHA256	
	TLS_ECDHE_RSA_WITH_CAMELLIA_128_GCM_SHA256	
	TLS_ECDHE_RSA_WITH_CAMELLIA_128_GCM_SHA256	
	TLS_ECDHE_ECDSA_WITH_AES_128_CCM_8	
	~~***TLS_DHE_RSA_WITH_AES_256_GCM_SHA384***~~	
	~~***TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384***~~	
	[Other Cipher Suites]	
[Any TLS Profile supported by <product>]	*[Any Cypher suite]*	

65 ***[Describe here the mechanisms and tools that are supported by the implementation for Certificate Distribution, Certificate Validation and Key Management.]***

Table Error! **No text of specified style in document.**-2 describes the configurable parameters and behaviors supported by this product for the Secure Transport Connection:

[Indicated in the "Configurable" column whether the parameters are configurable (Y) or not (N).]

70 **Table** Error! No text of specified style in document.**-2: Secure Transport Connection Configuration**

Local Secure Transport Connection Configuration			
Parameter/Behavior	**Configurable**	**Default Value**	**Comments**
Common Secure Transport Connection parameters			
Port	See Section **Error! Reference source not found. Error! Reference source not found.**		

A-P-ABORT provider reason in case of integrity check failure			
…	…		
~~**BCP195 TLS Secure Transport Connection**~~ **BCP 195 RFC 8996 TLS Secure Transport Connection** Parameters			
[List specific configurable parameters for the local system]			
~~**Non-Downgrading BCP195 TLS Secure Transport Connection**~~ **Modified BCP 195 RFC 8996 TLS Secure Transport Connection** Parameters			
[List specific configurable parameters for the local system]			
~~**Extended BCP195 TLS Secure Transport Connection Parameters**~~			
~~***[List specific configurable parameters for the local system]***~~			
Other Profile Secure Transport Connection parameters			
Remote Secure Transport Connection Configuration Parameters			
Parameter	**Configurable**	**Default Value**	**Comments**
Common Secure Transport Connection Parameters			
Port	See Section **Error! Reference source not found. Error! Reference source not found.**		
A-P-ABORT provider reason in case of integrity check failure			
…	…		
~~**BCP195 TLS Secure Transport Connection**~~ **BCP 195 RFC 8996 TLS Secure Transport Connection** Parameters			
[List specific configurable parameters for the local system]			
~~**Non-Downgrading BCP195 TLS Secure Transport Connection**~~ **Modified BCP 195 RFC 8996 TLS Secure Transport Connection** Parameters			
[List specific configurable parameters for the local system]			
~~**Extended BCP195 TLS Secure Transport Connection Parameters**~~			

~~*[List specific configurable parameters for the local system]*~~			
<Other Profile> Secure Transport Connection Parameters			

Part 15

Modify Section 2 Bibliography as shown

2 Normative References

[ECMA 235] ECMA. March 1996. *The ECMA GSS-API Mechanism*. http://www.ecma-international.org/publications/standards/Ecma-235.htm .

[ANSI X9.52] ANSI. 1998. *Triple Data Encryption Algorithm Modes of Operation*.

[DNS-SD] Cheshire S.. *DNS Self-Discovery*. http://www.dns-sd.org/ .

~~**[FIPS 46] National Institute of Standards and Technology. *Data Encryption Standard (DES).***~~

~~**[FIPS 81] National Institute of Standards and Technology. *DES Modes of Operation.***~~

[FIPS 180-1] National Institute of Standards and Technology. 17 April 1995. *SHA-1: Secure Hash Standard*.

[FIPS 180-2] National Institute of Standards and Technology. 1 August 2002. *SHA-2: Secure Hash Standard*.

~~**[ISCL V1.00] MEDIS-DC. *Integrated Secure Communication Layer V1.00.***~~

[ITU-T X.509] ITU. *Information technology - Open Systems Interconnection - The directory: Public-key and attribute certificate frameworks*. http://www.itu.int/rec/T-REC-X.509 . ITU-T Recommendation X.509 is similar to ISO/IEC 9594-8 1990. However, the ITU-T recommendation is the more familiar form, and was revised in 1993 and 2000, with two sets of corrections in 2001. ITU-T was formerly known as CCITT..

[RFC 1035] IETF. *Domain Name System (DNS)*. http://tools.ietf.org/html/rfc1035 .

[RFC 2030] IETF. *Simple Network Time Protocol (SNTP) Version 4*. http://tools.ietf.org/html/rfc2030 .

[RFC 2131] IETF. *Dynamic Host Configuration Protocol*. http://tools.ietf.org/html/rfc2131 .

[RFC 2132] IETF. *Dynamic Host Configuration Protocol Options*. http://tools.ietf.org/html/rfc2132 .

[RFC 2136] IETF. *Dynamic Updates in the Domain Name System (DNS UPDATE)*. http://tools.ietf.org/html/rfc2136 .

[RFC 2181] IETF. *Clarifications to the DNS Specification*. http://tools.ietf.org/html/rfc2181 .

[RFC 2219] IETF. *Use of DNS Aliases for Network Services*. http://tools.ietf.org/html/rfc2219 .

[RFC 2246] IETF. *Transport Layer Security (TLS) 1.0 Internet Engineering Task Force*. ~~**TLS is derived from SSL 3.0, and is largely compatible with it..**~~ http://tools.ietf.org/html/rfc2246 .

[RFC 2251] IETF. *Lightweight Directory Access Protocol (v3)*. http://tools.ietf.org/html/rfc2251 .

[RFC 2313] IETF. March 1998. *PKCS #1: RSA Encryption, Version 1.5*. http://tools.ietf.org/html/rfc2313 .

[RFC 2437] IETF. October 1998. *PKCS #1: RSA Cryptography Specifications - Version 2.0*. http://tools.ietf.org/html/rfc2437 .

[RFC 2563] IETF. *DHCP Option to Disable Stateless Auto-Configuration in IPv4 Clients*. http://tools.ietf.org/html/rfc2563 .

[RFC 2782] IETF. *A DNS RR for specifying the location of services (DNS SRV)*. http://tools.ietf.org/html/rfc2782 .

[RFC 2827] IETF. *Network Ingress Filtering: Defeating Denial of Service Attacks which employ IP Source Address Spoofing*. http://tools.ietf.org/html/rfc2827 .

[RFC 2849] IETF. *The LDAP Data Interchange Format (LDIF)*. http://tools.ietf.org/html/rfc2849 .

[RFC 2898] IETF. September 2000. *PKCS #5: Password-Based Cryptography Specification Version 2.0*. http://tools.ietf.org/html/rfc2898 .

[RFC 3161] IETF. March 2000. *Internet X.509 Public Key Infrastructure - Time-Stamp Protocol (TSP)*. http://tools.ietf.org/html/rfc3161 .

[RFC 3164] IETF. August 2001. *The BSD syslog Protocol*. http://tools.ietf.org/html/rfc3164 .

[RFC 3211] IETF. December 2001. *Password-based Encryption for CMS*. http://tools.ietf.org/html/rfc3211 .

[RFC 3268] IETF. June 2002. *Advanced Encryption Standard (AES) Ciphersuites for Transport Layer Security (TLS)*. http://tools.ietf.org/html/rfc3268 .

[RFC 3447] IETF. February 2003. *PKCS #1 RSA Cryptography Specifications Version 2.1*. http://tools.ietf.org/html/rfc3447 .

[RFC 3370] IETF. August 2002. *Cryptographic Message Syntax (CMS) Algorithms*. http://tools.ietf.org/html/rfc3370 .

[RFC 3565] IETF. July 2003. *Use of the Advanced Encryption Standard (AES) Encryption Algorithm in Cryptographic Message Syntax (CMS)*. http://tools.ietf.org/html/rfc3565 .

[RFC 3851] IETF. *Secure/Multipurpose Internet Mail Extensions (S/MIME) Version 3.1 Message Specification*. http://tools.ietf.org/html/rfc3851 .

[RFC 3853] IETF. *S/MIME Advanced Encryption Standard (AES) Requirement for the Session Initiation Protocol (SIP)*. http://tools.ietf.org/html/rfc3853 .

[RFC 3881] IETF. September 2004. *Security Audit and Access Accountability Message - XML Data Definitions for Healthcare Applications*. http://tools.ietf.org/html/rfc3881 .

[RFC 4033] IETF. March 2005. *DNS Security Introduction and Requirements*. http://tools.ietf.org/html/rfc4033 .

[RFC 4034] IETF. March 2005. *Resource Records for the DNS Security Extensions*. http://tools.ietf.org/html/rfc4034 .

[RFC 4035] IETF. March 2005. *Protocol Modifications for the DNS Security Extensions*.

~~**[RFC 4346] IETF. April 2006. *The Transport Layer Security (TLS) Protocol - Version 1.1*. http://tools.ietf.org/html/rfc4346 .**~~

~~**[RFC 4347] IETF. April 2006. *Datagram Transport Layer Security*. http://tools.ietf.org/html/rfc4347 .**~~

[RFC 5246] IETF. August 2008. *The Transport Layer Security (TLS) Protocol Version 1.2*. http://tools.ietf.org/html/rfc5246 .

[RFC 5424] IETF. *The Syslog Protocol*. http://tools.ietf.org/html/rfc5424 .

[RFC 5425] IETF. *Transport Layer Security (TLS) Transport Mapping for Syslog*. http://tools.ietf.org/html/rfc5425 .

[RFC 5426] IETF. *Transmission of Syslog Messages over UDP*. http://tools.ietf.org/html/rfc5426 .

[RFC 5652] IETF. September 2009. *Cryptographic Message Syntax*. http://tools.ietf.org/html/rfc5652 .

[RFC 5905] IETF. *Network Time Protocol Version 4: Protocol and Algorithms Specification*. http://tools.ietf.org/html/rfc5905 .

[RFC 5906] IETF. *Network Time Protocol Version 4: Autokey Specification*. http://tools.ietf.org/html/rfc5906 .

[RFC 6762] IETF. February 2013. *Multicast DNS*. http://tools.ietf.org/html/rfc6762 .

[RFC 6763] IETF. February 2013. *DNS-Based Service Discovery*. http://tools.ietf.org/html/rfc6763 .

[RFC 7525] ~~**IETF.**~~ **Sheffer, Y., Holz, R., and P. Saint-Andre,** *Recommendations for Secure Use of Transport Layer Security (TLS) and Datagram Transport Layer Security (DTLS)*. **BCP 195, RFC 7525, May 2015. https://www.rfc-editor.org/info/rfc7525** ~~**http://tools.ietf.org/html/rfc7525**~~ . **(Updated by RFC 8996 and Errata.)**

[RFC 8446] IETF. August 2018. *The Transport Layer Security (TLS) Protocol Version 1.3*. http://tools.ietf.org/html/rfc8446 .

[RFC 8553] IETF. *DNS AttrLeaf Changes: Fixing Specifications That Use Underscored Node Names*. http://tools.ietf.org/html/rfc8553 .

[RFC 8633] IETF. *RFC8633 Network Time Protocol Best Current Practices*. http://tools.ietf.org/html/rfc8633 .

[RFC 8996] Moriarty, K. and S. Farrell, "Deprecating TLS 1.0 and TLS 1.1", BCP 195, RFC 8996, March 2021. https://www.rfc-editor.org/rfc/rfc8996.html

[BCP 195] **IETF**, ***Information on BCP 195*, https://www.rfc-editor.org/info/bcp195 (References RFC 7525 and RFC 8996)** ~~**IETF. *Recommendations for Secure Use of Transport Layer Security (TLS) and Datagram Transport Layer Security (DTLS)*. https://tools.ietf.org/html/bcp195.**~~

[CRYPTREC] CRYPTREC: Cryptography Research and Evaluation Committees, Japan, https://www.cryptrec.go.jp/en/index.html

[IPA] IPA: Information-technology Promotion Agency, Japan, https://www.ipa.go.jp/index-e.html

Modify Section B.3

B.3 AES TLS Secure Transport Connection Profile

Retired. See PS3.15 2018a.

~~**Note**~~

~~**Applications implementing the AES TLS Secure Transport Connection Profile will connect and interoperate with implementations of the BCP 195 TLS Profile; see Section B.9 "BCP 195 TLS Secure Transport Connection Profile".**~~

Modify Section B.9

B.9 BCP 195 TLS Secure Transport Connection Profile

Retired. See PS3.15 2022d.

~~**An implementation that supports the [BCP 195] TLS Profile shall utilize the framework and negotiation mechanism specified by the Transport Layer Security protocol. It shall comply with [BCP 195] from the IETF.**~~

~~**Note**~~

~~**1. [BCP 195] is currently also published as [RFC 7525]. Both provide suggestions for proper use of TLS 1.2 and allow appropriate fallback rules.**~~

~~**2. Existing implementations that are compliant with the DICOM AES TLS Secure Connection Profile are able to interoperate with this profile. This profile adds significant recommendations by the IETF, but does not make them mandatory. This is the IETF recommendation for upgrading an installed base.**~~

~~**3. A device may support multiple different TLS profiles. DICOM does not specify how such devices are configured in the field or how different TLS profile-related rules are specified. The site will determine what configuration is appropriate.**~~

~~**4. The DICOM profiles for TLS describe the capabilities of a product. Product configuration may permit selection of a particular profile and/or additional negotiation rules. The specific ciphersuite used is negotiated by the TLS implementation based on these rules.**~~

~~**5. TLS 1.2 [RFC 5246] and TLS 1.3 [RFC 8446] incorporate requirements for cipher suites, signature methods, etc.**~~

~~**TCP ports on which an implementation accepts TLS connections, or the mechanism by which these port numbers are selected or configured, shall be stated in the Conformance Statement. The TCP ports on which an implementation accepts TLS connections for DICOMweb shall be different from those on which an implementation accepts TLS connections for DIMSE. The HTTP/HTTPS connection for DICOMweb can be shared with other HTTP/HTTPS traffic.**~~

~~Note~~

~~It is recommended that systems supporting the BCP 195 TLS Profile use the registered port number "2762 dicom-tls" for the DICOM Upper Layer Protocol on TLS.~~

~~The Conformance Statement shall indicate what mechanisms the implementation supports for Key Management. When an integrity check fails, the connection shall be dropped per the TLS protocol, causing both the sender and the receiver to issue an A-P-ABORT indication to the upper layers with an implementation-specific provider reason. The provider reason used shall be documented in the Conformance Statement.~~

~~Note~~

~~Implementers should take care to manage the risks of downgrading to less secure obsolescent protocols or cleartext protocols. See [BCP 195], Section 5.2 "Opportunistic Security".~~

Modify Section B.10

B.10 Non-Downgrading BCP 195 TLS Secure Transport Connection Profile

Retired. See PS3.15 2022d.

~~An implementation that supports the Non-Downgrading BCP 195 TLS Profile shall utilize the framework and negotiation mechanism specified by the Transport Layer Security protocol. It shall comply with [BCP 195] from the IETF with the additional restrictions enumerated below.~~

~~Note~~

~~1. A device may support multiple different TLS profiles. DICOM does not specify how such devices are configured in the field or how different TLS profile-related rules are specified. The site will determine what configuration is appropriate.~~

~~2. The DICOM profiles for TLS describe the capabilities of a product. Product configuration may permit selection of a particular profile and/or additional negotiation rules. The specific ciphersuite used is negotiated by the TLS implementation based on these rules.~~

~~The following additions are made to [BCP 195] requirements. They change some of the "should" recommendations in the RFC into requirements.~~

~~• Implementations shall not negotiate TLS version 1.1 [RFC 4346] or TLS version 1.0 [RFC 2246]~~

~~• Implementations shall not negotiate DTLS version 1.0 [RFC 4347]~~

~~• In cases where an application protocol allows implementations or deployments a choice between strict TLS configuration and dynamic upgrade from unencrypted to TLS-protected traffic (such as STARTTLS), clients and servers shall prefer strict TLS configuration.~~

~~• Application protocols typically provide a way for the server to offer TLS during an initial protocol exchange, and sometimes also provide a way for the server to advertise support for TLS (e.g., through a flag indicating that TLS is required); unfortunately, these indications are sent before the communication channel is encrypted. A client shall attempt to negotiate TLS even if these indications are not communicated by the server.~~

~~• The following cipher suites shall all be supported:~~

~~• TLS_DHE_RSA_WITH_AES_128_GCM_SHA256~~

~~• TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256~~

~~• TLS_DHE_RSA_WITH_AES_256_GCM_SHA384~~

~~• TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384~~

~~• Additional cipher suites of similar or greater cryptographic strength may be supported.~~

~~TCP ports on which an implementation accepts TLS connections, or the mechanism by which these port numbers are selected or configured, shall be stated in the Conformance Statement. The TCP ports on which an implementation accepts TLS connections for DICOMweb shall be different from those on which an implementation accepts TLS connections for DIMSE. The HTTP/HTTPS connection for DICOMweb can be shared with other HTTP/HTTPS traffic.~~

~~The Conformance Statement shall also indicate what mechanisms the implementation supports for Key Management.~~

~~Note~~

~~It is recommended that systems supporting the Non-Downgrading BCP 195 TLS Profile use the registered port number "2762 dicom-tls" for the DICOM Upper Layer Protocol on TLS. If both the Non-Downgrading BCP 195 TLS Profile and the BCP 195 TLS Profile are supported, it is recommended that they use the well known port numbers on different IP addresses.~~

~~The Conformance Statement shall indicate what mechanisms the implementation supports for Key Management.~~

~~When an integrity check fails, the connection shall be dropped per the TLS protocol, causing both the sender and the receiver to issue an A-P-ABORT indication to the upper layers with an implementation-specific provider reason. The provider reason used shall be documented in the Conformance Statement.~~

Modify Section B.11

B.11 Extended BCP 195 TLS Profile Secure Transport Connection Profile

Retired. See PS3.15 2022d.

~~An implementation that supports the Extended BCP 195 Profile shall utilize the framework and negotiation mechanism specified by the Transport Layer Security protocol. It shall comply with [BCP 195] from the IETF with the additional restrictions enumerated below.~~

~~Note~~

~~1. A device may support multiple different TLS profiles. DICOM does not specify how such devices are configured in the field or how different TLS profile-related rules are specified. The site will determine what configuration is appropriate.~~

~~2. The DICOM profiles for TLS describe the capabilities of a product. Product configuration may permit selection of a particular profile and/or additional negotiation rules. The specific ciphersuite used is negotiated by the TLS implementation based on these rules.~~

~~The following additions are made to [BCP 195] requirements. They change some of the "should" recommendations in the RFC into requirements.~~

~~• Implementations shall not negotiate TLS version 1.1 [RFC 4346] or TLS version 1.0 [RFC 2246]~~

~~• Implementations shall not negotiate DTLS version 1.0 [RFC 4347]~~

~~• In cases where an application protocol allows implementations or deployments a choice between strict TLS configuration and dynamic upgrade from unencrypted to TLS-protected traffic (such as STARTTLS), clients and servers shall prefer strict TLS configuration.~~

~~• Application protocols typically provide a way for the server to offer TLS during an initial protocol exchange, and sometimes also provide a way for the server to advertise support for TLS (e.g., through a flag indicating that TLS is required); unfortunately, these indications are sent before the communication channel is encrypted. A client shall attempt to negotiate TLS even if these indications are not communicated by the server.~~

~~• The following cipher suites shall all be supported:~~

~~• TLS_DHE_RSA_WITH_AES_128_GCM_SHA256~~

~~• TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256~~

~~• TLS_DHE_RSA_WITH_AES_256_GCM_SHA384~~

~~• TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384~~

~~• One or more of the following cipher suites should be supported:~~

~~• TLS_DHE_RSA_WITH_CAMELLIA_256_GCM_SHA384 (0xC0, 0x7D)~~

~~• TLS_DHE_RSA_WITH_CAMELLIA_128_GCM_SHA256 (0xC0,0x7C)~~

~~• TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384 (0xC0,0x2C)~~

~~• TLS_ECDHE_ECDSA_WITH_CAMELLIA_256_GCM_SHA384 (0xC0,0x87)~~

~~• TLS_ECDHE_RSA_WITH_CAMELLIA_256_GCM_SHA384 (0xC0,0x8B)~~

~~• TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256 (0xC0,0x2B)~~

~~• TLS_ECDHE_ECDSA_WITH_CAMELLIA_128_GCM_SHA256 (0xC0,0x86)~~

~~• TLS_ECDHE_RSA_WITH_CAMELLIA_128_GCM_SHA256 (0xC0,0x8A)~~

~~• No other cipher suites shall be used.~~

~~• When DHE is used by key exchange, the key length shall be 2048 bits or more.~~

~~• When ECDHE is used by key exchange, the key length shall be 256 bits or more.~~

~~TCP ports on which an implementation accepts TLS connections, or the mechanism by which these port numbers are selected or configured, shall be stated in the Conformance Statement. The TCP ports on which an implementation accepts TLS connections for DICOMweb shall be different from those on which an implementation accepts TLS connections for DIMSE. The HTTPS connection for DICOMweb can be shared with other HTTP/HTTPS traffic.~~

~~Note~~

~~**It is recommended that systems supporting the Extended BCP 195 TLS Profile use the registered port number "2762 dicom-tls" for the DICOM Upper Layer Protocol on TLS.**~~

~~**The Conformance Statement shall indicate what mechanisms the implementation supports for Key Management.**~~

~~**When an integrity check fails, the connection shall be dropped per the TLS protocol, causing both the sender and the receiver to issue an A-P-ABORT indication to the upper layers with an implementation-specific provider reason. The provider reason used shall be documented in the Conformance Statement.**~~

Add Section B.12

B.12 BCP 195 RFC 8996 TLS Secure Transport Connection Profile

An implementation that supports the BCP 195 RFC 8996 TLS Secure Transport Connection Profile shall utilize the framework and negotiation mechanism specified by the Transport Layer Security protocol. It shall comply with [BCP 195] which includes [RFC 8996], and [RFC 7525] as modified by [RFC 8996]. In the context of this profile, “client” refers to the entity initiating the TLS connection and “server” refers to the entity that is responding to that TLS connection initiation request. This may differ from the role that the entity might play in any DICOM transactions over the TLS connection.

Note

1. A device may support multiple TLS profiles. DICOM does not specify how such devices are configured in the field or how different TLS profile-related rules are specified. The site will determine what configuration is appropriate.
2. The DICOM profiles for TLS describe the capabilities of a product. Product configuration may permit selection of a particular profile and/or additional negotiation rules. The specific cipher suite used is negotiated by the TLS implementation based on these rules.

Servers and clients shall support TLS 1.2 and may support TLS 1.3. Clients shall attempt to negotiate TLS 1.3 if it is supported. Servers shall prefer TLS 1.3 if offered by the client.

In cases where an application protocol allows implementations or deployments a choice between strict TLS configuration and dynamic upgrade from unencrypted to TLS-protected traffic (such as STARTTLS), clients and servers shall prefer strict TLS configuration.

Application protocols typically provide a way for the server to offer TLS during an initial protocol exchange, and sometimes also provide a way for the server to advertise support for TLS (e.g., through a flag indicating that TLS is required). Unfortunately, these indications are sent before the communication channel is encrypted.

A client shall attempt to negotiate TLS even if the above indications are not communicated by the server.

All communications shall be encrypted with integrity checks enabled. Hence, implementations shall not use NULL key exchange, cipher, or signature/hash protocols.

Servers shall support bi-directional mutual authentication. Clients are not required, but are encouraged, to support and use bi-directional mutual authentication. The server may be configured to not use bi-directional mutual authentication.

The TCP ports on which an implementation accepts TLS connections for DICOMweb shall be different from those on which an implementation accepts TLS connections for DIMSE. The HTTP/HTTPS connection for DICOMweb can be shared with other HTTP/HTTPS traffic.

Note

It is recommended that systems supporting this Profile use the registered port number "2762 dicom-tls" for the DICOM Upper Layer Protocol on TLS, which is used by DIMSE.

The Conformance Statement shall indicate:

- TCP ports on which an implementation accepts TLS connections, or the mechanism by which these port numbers are selected or configured
- What mechanisms the implementation supports for Key Management.
- Which key exchange algorithms, cipher suites, and signature algorithms the implementation supports.

When an integrity check fails, the connection shall be dropped per the TLS protocol, causing both the sender and the receiver to issue an A-P-ABORT indication to the upper layers with an implementation-specific provider reason. The Conformance Statement shall document the provider reasons issued by the implementation.

Add Section B.13

B.13 Modified BCP 195 RFC 8996 TLS Secure Transport Connection Profile

An implementation that supports the Modified BCP 195 RFC 8996 TLS Secure Transport Connection Profile shall utilize the framework and negotiation mechanism specified by the Transport Layer Security protocol. It shall comply with [BCP 195] which includes [RFC 8996], and [RFC 7525] as modified by [RFC 8996] with the additional restrictions enumerated below. In the context of this profile, “client” refers to the entity initiating the TLS connection and “server” refers to the entity that is responding to that TLS connection initiation request. This may differ from the role that the entity might play in any DICOM transactions over the TLS connection.

Note

1. A device may support multiple TLS profiles. DICOM does not specify how such devices are configured in the field or how different TLS profile-related rules are specified. The site will determine what configuration is appropriate.
2. The DICOM profiles for TLS describe the capabilities of a product. Product configuration may permit selection of a particular profile and/or additional negotiation rules. The specific cipher suite used is negotiated by the TLS implementation based on these rules.

A client shall attempt to negotiate TLS even if the above indications are not communicated by the server.

The following cryptographic algorithms, grouped by function, shall not be used:

- Key Exchange
  - DH
  - ECDH
  - RSAES PKCS#1 v1.5 (RSA)
- Signature
  - GOST R 34.10-2012
- Block Cipher
  - RC2
  - EXPORT-RC2
  - IDEA
  - DES
  - EXPORT-DES
  - GOST 28147-89

    - Magma
    - 3-key Triple DES
    - Kuznyechik
    - ARIA
    - SEED
- Block Cipher Mode of Operation
    - CBC
    - CTR-OMAC
- Stream Cipher
    - RC4
    - EXPORT-RC4
- Hash Function
    - MD5
    - SHA-1
    - GOST R 34.11-2012

Only the following cryptographic algorithms, grouped by function, are permitted:

- Key Exchange
    - ECDHE
    - DHE
- Signature
    - ECDSA
    - RSASSA PKCS#1 v1.5 (RSA)
    - RSASSA-PSS
- Block Cipher
    - AES
    - Camellia
- Block Cipher Mode of Operation
    - GCM
    - CCM
    - CCM_8
- Stream Cipher
    - ChaCha20-Poly 1305
- Hash Function
    - SHA-256
    - SHA-384

When DHE is used for Key Exchange, the key length shall be 2048 bits or more. Cipher suites containing DHE shall not be selected when using implementations that do not allow explicit setting of the DHE key length.

When ECDHE is used for Key Exchange, the key length shall be 256 bits or more.

Servers shall support all of the following cipher suites for TLS 1.3. Clients that support TLS 1.3 shall support at least one of the following cipher suites.

- TLS_AES_256_GCM_SHA384
- TLS_CHACHA20_POLY1305_SHA256
- TLS_AES_128_GCM_SHA256
- TLS_AES_128_CCM_SHA256
- TLS_AES_128_CCM_8_SHA256

Note: In TLS 1.3 Key Exchange and Signature, algorithms are not specified in the cipher suite negotiation. Implementations may choose from the list above of permitted algorithms.

Servers shall support all of the following cipher suites for TLS 1.2..

- TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384
- TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384
- TLS_ECDHE_ECDSA_WITH_CAMELLIA_256_GCM_SHA384
- TLS_ECDHE_RSA_WITH_CAMELLIA_256_GCM_SHA384
- TLS_ECDHE_ECDSA_WITH_AES_256_CCM
- TLS_ECDHE_ECDSA_WITH_AES_256_CCM_8
- TLS_ECDHE_ECDSA_WITH_CHACHA20_POLY1305_SHA256
- TLS_ECDHE_RSA_WITH_CHACHA20_POLY1305_SHA256
- TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
- TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256
- TLS_ECDHE_ECDSA_WITH_CAMELLIA_128_GCM_SHA256
- TLS_ECDHE_RSA_WITH_CAMELLIA_128_GCM_SHA256
- TLS_ECDHE_ECDSA_WITH_AES_128_CCM
- TLS_ECDHE_ECDSA_WITH_AES_128_CCM_8

The above cipher suites are preferred for TLS 1.2. Clients that support TLS 1.2 shall support at least one of the cipher suites listed above or below. Servers may support the following cipher suites as a fallback for TLS 1.2 but are not required to do so.

- TLS_DHE_RSA_WITH_AES_256_GCM_SHA384
- TLS_DHE_RSA_WITH_CAMELLIA_256_GCM_SHA384
- TLS_DHE_RSA_WITH_AES_256_CCM
- TLS_DHE_RSA_WITH_AES_256_GCM_CCM_8
- TLS_DHE_RSA_WITH_CHACHA20_POLY1305_SHA256
- TLS_DHE_RSA_WITH_AES_128_GCM_SHA256
- TLS_DHE_RSA_WITH_CAMELLIA_128_GCM_SHA256
- TLS_DHE_RSA_WITH_AES_128_CCM
- TLS_DHE_RSA_WITH_AES_128_CCM_8

When using TLS 1.2, cipher suites other than those listed in either list above are not permitted.

The following requirements apply to Certificates within TLS:

- If the subject public key algorithm is RSA, the key length shall be 2048 bits or more.
- If the subject public key algorithm is ECC, the key length shall be 256 bits or more.
- If the certificate signature algorithm is RSA, the key length shall be 2048 bits or more.
- If the certificate signature algorithm is ECDSA, the key length shall be 256 bits or more.
- The hash function shall be SHA-256 or greater.

Servers shall support both TLS 1.2 and TLS 1.3. Clients shall support at least one of TLS 1.2 or TLS 1.3. Clients shall attempt to negotiate TLS 1.3 if it is supported. Servers shall prefer TLS 1.3 if offered by the client. Implementations may fall back to TLS 1.2 if the client does not negotiate TLS 1.3.

In cases where an application protocol allows implementations or deployments a choice between strict TLS configuration and dynamic upgrade from unencrypted to TLS-protected traffic (such as STARTTLS), clients and servers shall prefer strict TLS configuration.

Application protocols typically provide a way for the server to offer TLS during an initial protocol exchange, and sometimes also provide a way for the server to advertise support for TLS (e.g., through a

flag indicating that TLS is required); unfortunately, these indications are sent before the communication channel is encrypted.

Servers shall support bi-directional mutual authentication. Clients are not required, but are encouraged, to support and use bi-directional mutual authentication. The server may be configured to not use bi-directional mutual authentication.

The TCP ports on which an implementation accepts TLS connections for DICOMweb shall be different from those on which an implementation accepts TLS connections for DIMSE. The HTTP/HTTPS connection for DICOMweb can be shared with other HTTP/HTTPS traffic.

Note

It is recommended that systems supporting this Profile use the registered port number "2762 dicom-tls" for the DICOM Upper Layer Protocol on TLS.

The Conformance Statement shall indicate:

- TCP ports on which an implementation accepts TLS connections, or the mechanism by which these port numbers are selected or configured
- What mechanisms the implementation supports for Key Management.
- Which key exchange algorithms, cipher suites, and signature algorithms the implementation supports.

When an integrity check fails, the connection shall be dropped per the TLS protocol, causing both the sender and the receiver to issue an A-P-ABORT indication to the upper layers with an implementation-specific provider reason. The Conformance Statement shall document the provider reasons issued by the implementation.