**3GPP TSG-SA3 Meeting #123 S3-253036-r4**

Goteborg, Sweden, 25 – 29 August 2025

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **33.938** | **CR** | **0003** | **rev** | **1** | **Current version:** | **19.0.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network |  |

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| ***Title:*** | Additing references, reformatting tables and providing corrections to 4.2.12 of TR 33.938 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon, Qualcomm Incorporated, Apple, Nokia | | | | | | | | | |
| ***Source to TSG:*** | S3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | FS\_CryptoInv | | | | |  | ***Date:*** | | | 2025-08-18 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-19 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The Editor identified missing references in the TR 33.938. In addtition, the reference for LI is added, and corrections to 4.2.12 and some editional changes are providedin the TR. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Addition of missing references and corrections to multiple clauses. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Incompleted TR | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 1, 2, 3.1, 4.2.12, 4.3.1, 4.3.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Merger of S3-252784, S3-252783, S3-252818, S3-252819, S3-253049 | | | | | | | | |

\* \* \* First Change \* \* \* \*

# 1 Scope

The present document lists the security protocols that use cryptography in 3GPP specifications for the 5G System in the Standalone mode. They

* include the type of cryptography used by the protocol (symmetric/asymmetric)
* include the pointers to the protocol specification
* include the pointers to the relevant 3GPP cryptographic profiles
* include usage type (e.g., integrity, confidentiality, and/or authentication)

NOTE 1: the present document does not include resolution to PQC migration, and does not contain solutions that lead to any specification/normative work.

NOTE 2: the present document does not include protocols for Lawful Interception systems. The cryptographic inventory for those protocols is documented in TS 33.128 [49].

\* \* \* Next Change \* \* \* \*

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 33.210: "3G security; Network Domain Security (NDS); IP network layer security".

[3] 3GPP TS 33.310: "Network Domain Security (NDS); Authentication Framework (AF)".

[4] 3GPP TS 33.501: “Security architecture and procedures for 5G system”.

[5] IETF RFC 9190: "EAP-TLS 1.3: Using the Extensible Authentication Protocol with TLS 1.3".

[6] IETF RFC 5216: "The EAP-TLS Authentication Protocol".

[7] SECG SEC 1: “Recommended Elliptic Curve Cryptography”, Version 2.0, 2009. Available at <http://www.secg.org/sec1-v2.pdf>.

[8] SECG SEC 2: “Recommended Elliptic Curve Domain Parameters”, Version 2.0, 2010. Available at <http://www.secg.org/sec2-v2.pdf>.

[9] IETF RFC 9001: "Using TLS to Secure QUIC".

[10] IETF RFC 8152: "CBOR Object Signing and Encryption (COSE)".

[11] 3GPP TS 33.220: “Generic Authentication Architecture (GAA); Generic Bootstrapping Architecture (GBA)”.

[12] IETF RFC 8613: "Object Security for Constrained RESTful Environments (OSCORE)".

[13] 3GPP TS 33.180: "Security of the Mission Critical (MC) service".

[14] IETF RFC 6509: ''MIKEY-SAKKE: Sakai-Kasahara Key Encryption in Multimedia Internet KEYing (MIKEY)''.

[15] IETF RFC 5448: "Improved Extensible Authentication Protocol Method for 3rd Generation Authentication and Key Agreement (EAP-AKA')".

[16] 3GPP TS 35.205: "3G Security; Specification of the MILENAGE algorithm set: An example algorithm set for the 3GPP authentication and key generation functions f1, f1\*, f2, f3, f4, f5 and f5\*".

[17] 3GPP TS 35.231: "Specification of the TUAK algorithm set: A second example algorithm set for the 3GPP authentication and key generation functions f1, f1\*, f2, f3, f4, f5 and f5\*; Document 1: Algorithm specification".

[18] 3GPP TS 35.234: "Specification of the MILENAGE-256 algorithm set; An example set of 256-bit 3GPP authentication and key generation functions f1, f1\*, f2, f3, f4, f5, f5\* and f5\*\*; Document 1: General".

[19] NIST IR 8547 ipd: “Transition to Post-Quantum Cryptography Standards”

[20] IETF RFC 9147: "The Datagram Transport Layer Security (DTLS) Protocol Version 1.3".

[21] IETF RFC 8446: "The Transport Layer Security (TLS) Protocol Version 1.3".

[22] IETF RFC 6960: " X.509 Internet Public Key Infrastructure Online Certificate Status Protocol - OCSP".

[23] IETF RFC 7296: " Internet Key Exchange Protocol Version 2 (IKEv2)".

[24] IETF RFC 4303: "IP Encapsulating Security Payload (ESP)".

[25] IETF RFC 8221: "Cryptographic Algorithm Implementation Requirements and Usage Guidance

for Encapsulating Security Payload (ESP) and Authentication Header (AH)".

[26] IETF RFC 8750: "Implicit Initialization Vector (IV) for Counter-Based Ciphers in Encapsulating Security Payload (ESP)".`

[27] IETF RFC 7516: "JSON Web Encryption".

[28] IETF RFC 7515: "JSON Web Signature (JWS)".

[29] IETF RFC 6507: “Elliptic Curve-Based Certificateless Signatures for Identity-Based Encryption (ECCSI)”

[30] IETF RFC 6508: “Sakai-Kasahara Key Encryption (SAKKE)''

[31] IETF RFC 5869: "HMAC-based Extract-and-Expand Key Derivation Function (HKDF)".

[32] IETF RFC 4303: "IP Encapsulating Security Payload (ESP)".

[33] IETF RFC 3602: "The AES-CBC Cipher Algorithm and Its Use with IPsec".

[34] IETF RFC 4106: "The Use of Galois/Counter Mode (GCM) in IPsec Encapsulating Security Payload (ESP)".

[35] IETF RFC 4543: "The Use of Galois Message Authentication Code (GMAC) in IPsec ESP and AH".

[36] IETF RFC 4868: "Using HMAC-SHA-256, HMAC-SHA-384, and HMAC-SHA-512 with IPs".

[37] IETF RFC 6347: “Datagram Transport Layer Security Version 1.2”.

[38] IETF RFC 5246: “The Transport Layer Security (TLS) Protocol Version 1.2”.

[39] IETF RFC 5281: "Extensible Authentication Protocol Tunnelled Transport Layer Security Authenticated Protocol Version 0 (EAP-TTLSv0)".

[40] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".

[41] IETF RFC 6750: "The OAuth 2.0 Authorization Framework: Bearer Token Usage".

[42] IETF RFC 7519: "JSON Web Token (JWT)".

[43] 3GPP TS 29.500: "Technical Realization of Service Based Architecture".

[44] 3GPP TS 38.323: "Packet Data Convergence Protocol (PDCP) specification".

[45] IETF RFC 8017: "PKCS#1: RSA Cryptography Specifications Version 2.2".

[46] IETF RFC 4754: "IKE and IKEv2 Authentication Using the Elliptic Curve Digital Signature Algorithm (ECDSA)".

[47] NIST FIPS PUB 180-4: "Secure Hash Standard (SHS)".[48] IETF RFC 8442: "ECDHE\_PSK with AES-GCM and AES-CCM Cipher Suites for TLS 1.2 and DTLS 1.2”.

[49] 3GPP TS 33.128: " Protocol and procedures for Lawful Interception (LI)".

\* \* \* Next Change \* \* \* \*

# 3 Definitions of terms, symbols and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

**Asymmetric Cryptography** (NIST IR 8547 [19]):Also known as public-key cryptography, it is the cryptography that uses two separate keys to exchange data: one to encrypt or digitally sign the data and one to decrypt the data or verify the digital signature.

**Key Agreement** (NIST IR 8547 [19]): A (pair-wise) key-establishment procedure where the resultant secret keying material is a function of information contributed by two participants so that no party can predetermine the value of the secret keying material independently from the contributions of the other party.

**Key Derivation** (NIST IR 8547 [19]):The process of deriving a key in a non-reversible manner from shared information, some of which is secret.

**Symmetric Key Cryptography** (NIST IR 8547 [19]): A cryptographic algorithm that uses the same secret key for its operation and, if applicable, for reversing the effects of the operation.

\* \* \* Next Change \* \* \* \*

4.2.12 NAS security

The NAS security mechanisms are to protect NAS signaling and data between the UE and the AMF over the N1 reference point in 5G system:

- NAS signaling integrity and confidentiality protection between UE and AMF (see clause 6.4.3 and 6.4.4 of TS 33.501 [4]).

- Integrity and confidentiality protection for small user data or SMS as payload of a NAS message between UE and AMF (see clauses 6.16.1 and 6.4.7 of TS 33.501 [4]).

NAS security protocol employs symmetric cryptography for confidentiality and integrity protection.

\* \* \* Next Change \* \* \* \*

## 4.3 Summary Tables

### 4.3.1 3GPP Symmetric Cryptographic Algorithms

The following table summarizes the security related protocols used in 3GPP employing symmetric cryptographic algorithms including hash functions (5G System).

Table 4.3.1-1: Protocols Used in 3GPP Employing Symmetric Cryptographic Algorithms (5G System)

| Protocol/Function | Protocol Profile, Clauses | Cryptographic Algorithm(s) | Feature(s), Usage Type |
| --- | --- | --- | --- |
| MIKEY-SAKKE (IETF RFC 6509) [14] | IETF RFC 6509 [14], Appendix A | SHA-256 | Hash Function |
| KDF(TS 33.220, Clause B.2 [11]) | TS 33.220 [11], Clause B.2.0 | HMAC-SHA-256 | Session Key Derivation |
| TS 33.501 [4], Clause C.3 | ANSI-X9.63-KDF | Session Key Derivation |
| ECIES ([7], [8]) | TS 33.501 [4], Clause C.3 | SHA-256,  HMAC-SHA-256, | Session Key Derivation |
| HMAC–SHA-256 | Integrity Protection |
| AES-128-CTR | Confidentiality Protection |
| PKI | TS 33.310 [3], Clause 6.1.1 | SHA-256  SHA-384 | Hash Function |
| OCSP (IETF RFC 6960 [22]) | TS 33.310 [3], Clause 6.1b | SHA-256  SHA-384 | Hash Function |
| COSE (IETF RFC 8152[10]) | TS 33.220 [11], Clause P.3.3 | HMAC-based KDF with SHA-256 [31] | Session Key Derivation /  Hash Function |
| AES-CCM-16-64-128 | Confidentiality and Integrity Protection |
| EAP-TLS (IETF RFCs 9190 [5], 5216 [6]) | TS 33.501 [4], Clause B.2.1 | AEAD\_AES\_128\_GCM | Confidentiality and Integrity Protection |
| HKDF (RFC5869 [31]) | Session Key Derivation |
| EAP TTLS (IETF RFC 5281 [39]) | TS 33.501 [4], Annex U  TS 33.210 [2] clause 6.2 for TLS | See TLS in this table | Confidentiality and Integrity Protection |
| Session Key Derivation |
| OAuth 2.0 (IETF RFC 6749 [40], 6750 [41]) | TS 33.210 [2] clause 6.2 for TLS | See TLS 1.2 and TLS 1.3 in this table | Confidentiality and Integrity Protection |
| Hash Function |
| TS 33.210 [2] clause 6.3 for JWE/JWS | See JWE and JWS in this table | Confidentiality and Integrity Protection |
| Hash Function |
| IKEv2 (IETF RFC 7296 [23]) | TS 33.210 [2] clause 5.4 | 128-AES GCM SHA-256 (IETF RFC 8442 [48])  256-AES GCM SHA-384 (IETF RFC 8442 [48]) | Confidentiality and Integrity Protection |
| TS 33.310 [3] clauses 5,6,7 | SHA2-256/384 [47] | Hash Function |
| PDCP security (TS 38.323 [44]) | TS 33.501 [4], Annex D | 128-NEA1, 128-NIA1  128-NEA2, 128-NIA2  128-NEA3, 128-NIA3 | Confidentiality and Integrity Protection |
| NAS security (TS 33.501 [4]) | TS 33.501 [4], Annex D | 128-NEA1, 128-NIA1  128-NEA2, 128-NIA2  128-NEA3, 128-NIA3 | Confidentiality and Integrity Protection |
| IPsec ESP (IETF RFCs 4303 [32], 8221 [25], 8750 [26]) | TS 33.210 [2] | ENCR\_AES\_CBC (IETF RFC 3602 [33]) | Confidentiality Protection |
| ENCR\_AES\_GCM\_16 (IETF RFC 4106 [34])  ENCR\_AES\_GCM\_16\_IIV (IETF RFC 8750 [26]) | Confidentiality and Integrity Protection |
| AUTH\_AES\_128\_GMAC (IETF RFC 4543 [35])  AUTH\_HMAC\_SHA2\_256\_128 (IETF RFC 4868 [36]) | Authentication |
| DTLS 1.2 (IETF RFC 6347 [37]) | TS 33.210 [2] clause 6.2.1 | See TLS 1.2 in this table | Confidentiality and Integrity Protection |
| DTLS 1.3 (IETF RFC 9147 [20]) | TS 33.210 [2] clause 6.2.1 | See TLS 1.3 in this table | Confidentiality and Integrity Protection |
| TLS 1.2 (IETF RFC 5246 [38]) | TS 33.210 [2] clauses 6.2.1, 6.2.3 | AES\_128\_GCM, AES\_256\_GCM | Confidentiality and Integrity Protection |
| SHA256, SHA384 | Hash Function |
| TLS 1.3 (IETF RFC 8446 [21]) | TS 33.210 [2] clauses 6.2.1, 6.2.2 | AES\_128\_GCM, AES\_256\_GCM, CHACHA20\_POLY1305 | Confidentiality and Integrity Protection |
| SHA-256, SHA-384 | Hash Function |
| JWE (IETF RFC 7516 [27]) | TS 33.210 [2] clauses 6.3.1, 6.3.2 | AES\_128\_GCM, AES\_256\_GCM | Confidentiality and Integrity Protection |
| JWS (IETF RFC 7515 [28]) | TS 33.210 [2] clauses 6.3.1, 6.3.3 | SHA-256 | Hash Function |

| Protocol/Function | Protocol Profile, Clauses | Cryptographic Algorithm(s) | Feature(s), Usage Type |
| --- | --- | --- | --- |
| COSE (IETF RFC 8152[10]) | TS 33.220 [11], Clause P.3.3 | HMAC-based KDF with SHA-256 [31] | Session Key Derivation /  Hash Function |
| AES-CCM-16-64-128 | Confidentiality and Integrity Protection |
| DTLS 1.2 (IETF RFC 6347 [37]) | TS 33.210 [2] clause 6.2.1 | See TLS 1.2 in this table | Confidentiality and Integrity Protection |
| DTLS 1.3 (IETF RFC 9147 [20]) | TS 33.210 [2] clause 6.2.1 | See TLS 1.3 in this table | Confidentiality and Integrity Protection |
| EAP-TLS (IETF RFCs 9190 [5], 5216 [6]) | TS 33.501 [4], Clause B.2.1 | AEAD\_AES\_128\_GCM | Confidentiality and Integrity Protection |
| HKDF (RFC5869 [31]) | Session Key Derivation |
| EAP TTLS (IETF RFC 5281 [39]) | TS 33.501 [4], Annex U  TS 33.210 [2] clause 6.2 for TLS | See TLS in this table | Confidentiality and Integrity Protection |
| Session Key Derivation |
| ECIES ([7], [8]) | TS 33.501 [4], Clause C.3 | SHA-256,  HMAC-SHA-256, | Session Key Derivation |
| HMAC–SHA-256 | Integrity Protection |
| AES-128-CTR | Confidentiality Protection |
| IKEv2 (IETF RFC 7296 [23]) | TS 33.210 [2] clause 5.4 | 128-AES GCM SHA-256 (IETF RFC 8442 [48])  256-AES GCM SHA-384 (IETF RFC 8442 [48]) | Confidentiality and Integrity Protection |
| TS 33.310 [3] clauses 5,6,7 | SHA2-256/384 [47] | Hash Function |
| IPsec ESP (IETF RFCs 4303 [32], 8221 [25], 8750 [26]) | TS 33.210 [2] | ENCR\_AES\_CBC (IETF RFC 3602 [33]) | Confidentiality Protection |
| ENCR\_AES\_GCM\_16 (IETF RFC 4106 [34])  ENCR\_AES\_GCM\_16\_IIV (IETF RFC 8750 [26]) | Confidentiality and Integrity Protection |
| AUTH\_AES\_128\_GMAC (IETF RFC 4543 [35])  AUTH\_HMAC\_SHA2\_256\_128 (IETF RFC 4868 [36]) | Authentication |
| JWE (IETF RFC 7516 [27]) | TS 33.210 [2] clauses 6.3.1, 6.3.2 | AES\_128\_GCM, AES\_256\_GCM | Confidentiality and Integrity Protection |
| JWS (IETF RFC 7515 [28]) | TS 33.210 [2] clauses 6.3.1, 6.3.3 | SHA-256 | Hash Function |
| KDF(TS 33.220, Clause B.2 [11]) | TS 33.220 [11], Clause B.2.0 | HMAC-SHA-256 | Session Key Derivation |
| TS 33.501 [4], Clause C.3 | ANSI-X9.63-KDF | Session Key Derivation |
| MIKEY-SAKKE (IETF RFC 6509) [14] | IETF RFC 6509 [14], Appendix A | SHA-256 | Hash Function |
| NAS security (TS 33.501 [4]) | TS 33.501 [4], Annex D | 128-NEA1, 128-NIA1  128-NEA2, 128-NIA2  128-NEA3, 128-NIA3 | Confidentiality and Integrity Protection |
| OAuth 2.0 (IETF RFC 6749 [40], 6750 [41]) | TS 33.210 [2] clause 6.2 for TLS | See TLS 1.2 and TLS 1.3 in this table | Confidentiality and Integrity Protection |
| Hash Function |
| TS 33.210 [2] clause 6.3 for JWE/JWS | See JWE and JWS in this table | Confidentiality and Integrity Protection |
| Hash Function |
| OCSP (IETF RFC 6960 [22]) | TS 33.310 [3], Clause 6.1b | SHA-256  SHA-384 | Hash Function |
| PDCP security (TS 38.323 [44]) | TS 33.501 [4], Annex D | 128-NEA1, 128-NIA1  128-NEA2, 128-NIA2  128-NEA3, 128-NIA3 | Confidentiality and Integrity Protection |
| PKI | TS 33.310 [3], Clause 6.1.1 | SHA-256  SHA-384 | Hash Function |
| TLS 1.2 (IETF RFC 5246 [38]) | TS 33.210 [2] clauses 6.2.1, 6.2.3 | AES\_128\_GCM, AES\_256\_GCM | Confidentiality and Integrity Protection |
| SHA256, SHA384 | Hash Function |
| TLS 1.3 (IETF RFC 8446 [21]) | TS 33.210 [2] clauses 6.2.1, 6.2.2 | AES\_128\_GCM, AES\_256\_GCM, CHACHA20\_POLY1305 | Confidentiality and Integrity Protection |
| SHA-256, SHA-384 | Hash Function |

\* \* \* Next Change \* \* \* \*

### 4.3.2 3GPP Asymmetric Cryptographic Algorithms

The following table summarizes the security related protocols used in 3GPP employing asymmetric cryptographic algorithms (5G System).

Table 4.3.2-1: Protocols Used in 3GPP Employing Asymmetric Cryptographic Algorithms (5G System)

| Protocol/Function | Protocol Profile, Clauses | Cryptographic Algorithm(s) | Feature(s), Usage Type |
| --- | --- | --- | --- |
| MIKEY-SAKKE (IETF RFC 6509) [14] | IETF RFC 6507 [29] | ECCSI | Digital signature |
| IETF RFC 6508 [30] | SAKKE | Key agreement |
| ECIES ([7], [8]) | TS 33.501 [4], Clause C.3 | ECDH | Key Agreement |
| PKI | TS 33.310 [3], Clause 6.1.1 | RSA,  ECDSA | Authentication /  Digital Signature |
| OCSP (IETF RFC 6960 [22]) | TS 33.310 [3], Clause 6.1b | RSA  ECDSA | Authentication /  Digital Signature |
| EAP-TLS (IETF RFCs 9190 [5], 5216 [6]) | TS 33.501 [4],  Clause B.2.1 | See TLS in this table. | Authentication /  Digital Signature /  Confidentiality Protection /  Hash Function |
| TS 33.501 [4]  RFC 9190 (TLS1.3) [5] | ECDHE | Key Agreement |
| EAP-TTLS (IETF RFC 5281 [39]) | TS 33.501 [4], Annex U  TS 33.210 [2] clause 6.2 for TLS | See TLS in this table | Key Agreement |
| See TLS in this table | Authentication /  Digital Signature /  Confidentiality Protection /  Hash Function |
| OAuth 2.0 (IETF RFC 6749 [40], 6750 [41]) | TS 33.210 [2] clause 6.2 for TLS | See TLS 1.2 and TLS 1.3 in this table | Key Agreement |
| Digital Signature |
| TS 33.210 [2] clause 6.3 for JWE/JWS | See JWE and JWS in this table | Key Agreement |
| Digital Signature |
| IKEv2 (IETF RFC 7296 [23]) | TS 33.210 [2] clause 5.4 | DH | Key Agreement |
| TS 33.310 [3] clauses 5,6,7 | RSA Sha-256/384 (IETF RFC 8017 [45])  ECDSA SHA-256/384/512 (IETF RFC 4754 [46])  RSASSA-PSS SHA-256 [47] | Digital Signature |
| SHA2-256/384 [47] | Hash Function |
| DTLS 1.2 (IETF RFC 6347 [37]) | TS 33.210 [2] clause 6.2.1 | See TLS 1.2 in this table | Confidentiality and Integrity Protection |
| DTLS 1.3 (IETF RFC 9147 [20]) | TS 33.210 [2] clause 6.2.1 | See TLS 1.2 in this table | Confidentiality and Integrity Protection |
| TLS 1.2 (IETF RFC 5246 [38]) | TS 33.210 [2] clauses 6.2.1, 6.2.3 | ECDHE | Key Agreement |
| ECDSA, RSA | Digital Signature |
| TLS 1.3 (IETF RFC 8446 [21]) | TS 33.210 [2] clauses 6.2.1, 6.2.2 | ECDHE | Key Agreement |
| ECDSA, RSA | Digital Signature |
| JWE (IETF RFC 7516 [27]) | TS 33.210 [2] clauses 6.3.1, 6.3.2 | ECDH-ES | Key Agreement |
| JWS (IETF RFC 7515 [28]) | TS 33.210 [2] clauses 6.3.1, 6.3.3 | ECDSA | Digital Signature |

| Protocol/Function | Protocol Profile, Clauses | Cryptographic Algorithm(s) | Feature(s), Usage Type |
| --- | --- | --- | --- |
| DTLS 1.2 (IETF RFC 6347 [37]) | TS 33.210 [2] clause 6.2.1 | See TLS 1.2 in this table | Confidentiality and Integrity Protection |
| DTLS 1.3 (IETF RFC 9147 [20]) | TS 33.210 [2] clause 6.2.1 | See TLS 1.2 in this table | Confidentiality and Integrity Protection |
| EAP-TLS (IETF RFCs 9190 [5], 5216 [6]) | TS 33.501 [4],  Clause B.2.1 | See TLS in this table. | Authentication /  Digital Signature /  Confidentiality Protection /  Hash Function |
| TS 33.501 [4]  RFC 9190 (TLS1.3) [5] | ECDHE | Key Agreement |
| EAP-TTLS (IETF RFC 5281 [39]) | TS 33.501 [4], Annex U  TS 33.210 [2] clause 6.2 for TLS | See TLS in this table | Key Agreement |
| See TLS in this table | Authentication /  Digital Signature /  Confidentiality Protection /  Hash Function |
| ECIES ([7], [8]) | TS 33.501 [4], Clause C.3 | ECDH | Key Agreement |
| IKEv2 (IETF RFC 7296 [23]) | TS 33.210 [2] clause 5.4 | DH | Key Agreement |
| TS 33.310 [3] clauses 5,6,7 | RSA Sha-256/384 (IETF RFC 8017 [45])  ECDSA SHA-256/384/512 (IETF RFC 4754 [46])  RSASSA-PSS SHA-256 [47] | Digital Signature |
| SHA2-256/384 [47] | Hash Function |
| JWE (IETF RFC 7516 [27]) | TS 33.210 [2] clauses 6.3.1, 6.3.2 | ECDH-ES | Key Agreement |
| JWS (IETF RFC 7515 [28]) | TS 33.210 [2] clauses 6.3.1, 6.3.3 | ECDSA | Digital Signature |
| MIKEY-SAKKE (IETF RFC 6509) [14] | IETF RFC 6507 [29] | ECCSI | Digital signature |
| IETF RFC 6508 [30] | SAKKE | Key agreement |
| OAuth 2.0 (IETF RFC 6749 [40], 6750 [41]) | TS 33.210 [2] clause 6.2 for TLS | See TLS 1.2 and TLS 1.3 in this table | Key Agreement |
| Digital Signature |
| TS 33.210 [2] clause 6.3 for JWE/JWS | See JWE and JWS in this table | Key Agreement |
| Digital Signature |
| OCSP (IETF RFC 6960 [22]) | TS 33.310 [3], Clause 6.1b | RSA  ECDSA | Authentication /  Digital Signature |
| PKI | TS 33.310 [3], Clause 6.1.1 | RSA,  ECDSA | Authentication /  Digital Signature |
| TLS 1.2 (IETF RFC 5246 [38]) | TS 33.210 [2] clauses 6.2.1, 6.2.3 | ECDHE | Key Agreement |
| ECDSA, RSA | Digital Signature |
| TLS 1.3 (IETF RFC 8446 [21]) | TS 33.210 [2] clauses 6.2.1, 6.2.2 | ECDHE | Key Agreement |
| ECDSA, RSA | Digital Signature |

\* \* \* End of Changes \* \* \* \*