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Security Mechanism Names for Media
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Abstract

Negotiating the security mechanisms used between a Session Initiation Protocol (SIP) user agent and its next-hop SIP entity is described in RFC 3329 [4]. This document adds the capability to distinguish security mechanisms that apply to the media plane by defining a new Session Initiation Protocol (SIP) header field parameter to label such security mechanisms.

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [3].

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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1. Problem Statement

In the 3GPP defined architecture and SIP profile for packet-domain communication, SIP signalling is security protected at the network

layer but media-plane traffic is not (it is protected by the cellular wireless access). The SIP signalling security used by 3GPP runs from the user device to the first hop proxy and negotiation of security mechanism and the start of security protection is described in RFC 3329 [4]. Because the 3GPP architecture also allows access technologies that do not protect media, e.g. WiFi, this document extends the negotiation of security mechanism to the media plane. During previous discussion of the topic of media plane security it was suggested that DTLS-SRTP should be used, but 3GPP considered this impractical to implement in the 3GPP-defined architecture and also limited in terms of meeting all 3GPP requirements which include protection of non-RTP media such as MSRP.

The purpose of this specification is to define a new header field parameter for the Session Initiation Protocol (SIP) [1] that distinguishes security mechanisms that apply to the media plane and to create an IANA registry for these mechanisms. This header field parameter may be used with the Security-Client, Security-Server, and Security-Verify header fields defined by RFC 3329 [4].

2. Introduction

RFC 3329 [4] describes negotiation of a security mechanism for SIP signalling between a UAC and its first hop proxy and allows a client or network to ensure that protection of SIP signalling is is turned on when the client registers with the network. SIP signalling is then protected as it traverses the access network. To enable similar protection for media, this document enables client and network to exchange their security capabilities for the media plane combined with the negotiation described in RFC 3329 [4]. Similar to the signalling plane, the evolution of security mechanisms for media often introduces new algorithms, or uncovers problems in existing ones, making capability exchange of such mechanisms a necessity.

3. Access Network Protection

Some access technologies, such as many cellular wireless accesses, protect the data passed over them by default but some, such as WLAN, do not. For accesses with no inherent protection, it is useful for the media controlled by SIP signalling to be protected by default because of vulnerability to eavesdropping. It is currently possible for a UA to request protection of the media plane end-to-end by including the crypto attribute in SDP at session setup. This does not guarantee protection however, because it relies on support of encryption by the called UA, or by another entity in the path taken by the media. In some cases, the session will originate in an access that protects the media and terminate in one that does not, meaning that media is protected in all but some hops of its path. In cases

where the same provider supplies the user equipment and provides the IP access, the IP access technology that the UA will use is predictable and the media is vulnerable only as far as the core network. In such cases, the user equipment it is possible to protect the media plane by encrypting at the UA and decrypting at the edge of the core network, and for the user agent that originates or terminates the session to expect the edge of the core network to be capable of encrypting and decrypting media. The header field parameter described in this document enables this case of first-hop protection, which is typically provided by default to a user agent.

4. Solution

4.1. Signalling security negotiation

A specification already exists for setting up security for SIP signaling between a client and its first-hop proxy, as defined in RFC 3329 [4] which gives an overview of the mechanism as follows:

1. Client ----------client list---------> Server
2. Client <---------server list---------- Server
3. Client ------(turn on security)------- Server
4. Client ----------server list---------> Server
5. Client <---------ok or error---------- Server

Figure 1: Security agreement message flow from RFC 3329

The security mechanism above ensures that SIP signalling is protected between a client and its first hop entity but the media plane is still unprotected. This document proposes that client and server additionally exchange their media plane security capabilities at step 1 and 2. Media plane security needs to be applied on a per-media basis at the time that media is initiated. Therefore the client and server need not turn on media plane security immediately.

This document defines the "mediasec" header field parameter that labels any of the Security-Client:, Security-Server:, or Security-Verify: header fields as applicable to the media plane and not the signalling plane.

4.2. Header fields for signalling security negotiation

The "mediasec" header field parameter defined in this document is used with procedures defined in RFC 3329 [4] to distinguish media plane security, with the difference that media plane security need not be started immediately and can be applied and removed on-the-fly

as media are added and removed within a session. The SIP responses that can contain the Security-Client, Security-Server, and Security-Verfiy header fields are SIP responses 421 (Extension Required) and 494 (Security Agreement Required) as defined in RFC 3329 [4].

4.3. Syntax

This document does not define any new SIP header fields, it defines a header field parameter for header fields Security-Client, Security-Server and Security-Verify defined in RFC 3329 [4].

4.4. Protocol Operation

4.4.1. The "mediasec" Header Field Parameter

The "mediasec" header field parameter may be used in the Security-Client, Security-Server, or Security-Verfiy header fields defined in RFC 3329 [4] to indicate that a header field applies to the media plane. Any one of the media plane security mechanisms supported by both client and server, if any, may be applied when a media stream is started. Or a media stream may be set up without security.

Values in the Security-Client, Security-Server, or Security-Verfiy header fields labelled with the "mediasec" header field parameter are specfic to the media plane and specific to the secure media transport protocol used on the media plane.

4.4.2. Client Initiated

A client wishing to use the security capability exchange of this specification MUST add a Security-Client header field to a request addressed to its first-hop proxy (i.e., the destination of the request is the first-hop proxy). This header field contains a list of all the media plane security mechanisms that the client supports. The client SHOULD NOT add preference parameters to this list. The client MUST add a "mediasec" header field parameter to the Security-Client header field.

The contents of the Security-Client header field may be used by the server to include any necessary information in its response.

As described in RFC 3329 [4], the response will be 494 if the client includes "sec-agree" in the Require and Proxy-Require header fields, or a 2xx response if the Require and Proxy-Require header fields do not contain "sec-agree". The server MUST add its list to the response even if there are no common security mechanisms in the client's and server's lists. The server's list MUST NOT depend on the contents of the client's list.

Any subsequent SIP requests sent by the client to that server MAY make use of the media security capabilities exchanged in the previous step by including media plane security parameters in SDP in the session or the media description. These requests MUST contain a Security-Verify header field that mirrors the server's list received previously in the Security-Server header field.

The server MUST check that the security mechanisms listed in the Security-Verify header field of incoming requests correspond to its static list of supported security mechanisms.

Note that, following the standard SIP header field comparison rules defined in RFC 3261 [7], both lists have to contain the same security mechanisms in the same order to be considered equivalent. In addition, for each particular security mechanism, its parameters in both lists need to have the same values.

The server can proceed processing a particular request if, and only if, the list was not modified. If modification of the list is detected, the server MUST respond to the client with a 494 (Security Agreement Required) response. This response MUST include the server's unmodified list of supported security mechanisms.

Once security capabilities have been exchanged between two SIP entities, the same SIP entities MAY use the same security when communicating with each other in different SIP roles. For example, if a UAC and its outbound proxy exchange some media-plane security mechanisms, they may try to use the same security for incoming requests (i.e., the UA will be acting as a UAS).

The user of a UA SHOULD be informed about the results of the security mechanism agreement. The user MAY decline to accept a particular security mechanism, and abort further SIP communications with the peer.

4.5. Security Mechanism Initiation

Once the client chooses a security mechanism from the list received in the Security-Server header field from the server, it MAY initiate that mechanism on a session level, or on a media level when it initiates new media in an existing session.

4.6. Duration of Security Assocations

Once media-plane security capabilities have been exchanged, both the server and the client need to know until when they can be used. The media plane security mechanism setup is valid for as long as the UA has a SIP signalling relationship with its first-hop proxy or until

new keys are exchanged in SDP. The SDP used to set up media plane security will be protected by a security association used to protect SIP signalling and the media plane security mechanism can be used until the signalling plane security association expires.

4.7. Summary of Header Field Use

The header fields defined in this document may be used to exchange supported media plane security mechanisms between a UAC and other SIP entities including UAS, proxy, and registrar. Information about the use of headers in relation to SIP methods and proxy processing is given in RFC 3329 [4] Table 1.

5. Backwards Compatibility

Security mechanisms that apply to the media plane only MUST NOT have the same name as any signalling plane mechanism. If a signalling plane security mechanism name is re-used for the media plane and distinguished only by the "mediasec" parameter, then implementations that do not recognize the "mediasec" parameter may incorrectly use that security mechanism for the signalling plane.

6. Examples

The following examples illustrate the use of the mediasec header field parameter defined above.

6.1. Initial Registration 3GPP

At initial registration, the client includes its supported media plane security mechanisms in the SIP REGISTER request. The first-hop proxy returns its supported media plane security mechanisms in the SIP 401 (Unauthorized) response.

As per RFC 3329 [4], a UA negotiates the security mechanism for the media plane to be used with its outbound proxy without knowing beforehand which mechanisms the proxy supports, as shown in Figure 2 below.

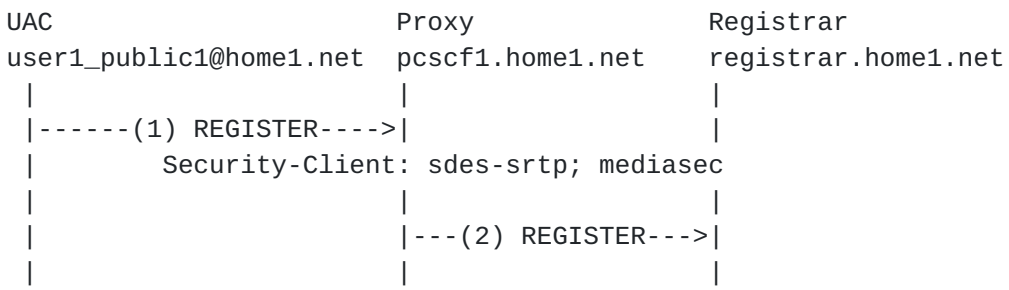


Figure 2: Exchange of Media Security Mechanisms at Initial Registration

The UAC sends a REGISTER request (1) to its outbound proxy indicating the security mechanisms for the media plane and that it supports in a Security-Client: header field. Indication of media security mechanisms is identified by the "mediasec" header field parameter.

The outbound proxy forwards the REGISTER request (2) to the registrar with the Security-Client: header field removed as described in RFC 3329 [4].

The registrar responds with a 401 (Unauthorized) response (3) to the REGISTER request.

The outbound proxy responds forwards the 401 (Unauthorized) response (4) to the UAC with its own list of security mechanisms for the media plane in the Security-Server: header field. Security mechanisms for the media plane are distinguished by the "mediasec" header field parameter.

The UAC sends a second REGISTER request (5) using the security credentials it received in the 401 (Unauthorized) response. The UAC includes the security mechanisms for the media plane and that it supports in a Security-Client: header field. The UAC also echos the list of security mechanisms it received from the outbound proxy in the Security-Server: header field. Media security mechanisms are distinguished by the "mediasec" header field parameter.

The REGISTER request is forwarded to the registrar (6) and the registrar responds with 200 OK (7), which is forwarded to the UAC (8).

When the connection is successfully established, the UAC sends an INVITE request(9) including an SDP description of the media plane security to be used (a="e2ae" and a crypto attribute). This INVITE contains a copy of the server's security list in a Security-Verify header field. The server verifies it, and since it matches its static list, it processes the INVITE and forwards it to the next hop.

If this example was run without the Security-Server header field in Step (2), the UAC would not know what kind of security the other one supports, and would be forced to make error-prone trials.

More seriously, if the Security-Verify header field was omitted in Step (3), the whole process would be prone to MitM attacks. An attacker could remove the media plane security description from the header in Step (1), therefore preventing protection of the media plane.

```
     (1) REGISTER sip:registrar.home1.net SIP/2.0
         Via: SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd];comp=sigcomp;branch=z9hG4bKnashds7
         Max-Forwards: 70
         P-Access-Network-Info: 3GPP-UTRAN-TDD; utran-cell-
id-3gpp=234151D0FCE11
         From: <sip:user1_public1@home1.net>;tag=4fa3
         To: <sip:user1_public1@home1.net>
         Contact: <sip:[5555::aaa:bbb:ccc:ddd];comp=sigcomp>;expires=600000
         Call-ID: apb03a0s09dkjdfglkj49111
         Authorization: Digest username="user1_private@home1.net",
realm="registrar.home1.net", nonce="", uri="sip:registrar.home1.net",
response=""
         Security-Client: ipsec-3gpp; alg=hmac-sha-1-96; spi-c=23456789; spi-
s=12345678; port-c=2468; port-s=1357
         Security-Client: sdes-srtp; mediasec ***new***
         Require: sec-agree
```

```
Proxy-Require: sec-agree
CSeq: 1 REGISTER
Supported: path
Content-Length: 0
```

```
     (2) REGISTER sip:registrar.home1.net SIP/2.0
         Via: SIP/2.0/UDP pcscf1.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd];comp=sigcomp;branch=z9hG4bKnashds7
         Max-Forwards: 69
         P-Access-Network-Info:
         Path:
         Require:
         P-Visited-Network-ID:
         P-Charging-Vector:
         From:
         To:
         Contact:
         Call-ID:
         Authorization:
         CSeq:
         Supported:
         Content-Length:

     (3) SIP/2.0 401 Unauthorized
         Via: SIP/2.0/UDP pcscf1.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd];comp=sigcomp;branch=z9hG4bKnashds7
         From: <sip:user1_public1@home1.net>;tag=4fa3
         To: <sip:user1_public1@home1.net>; tag=5ef4
         Call-ID: apb03a0s09dkjdfglkj49111
         WWW-Authenticate: Digest realm="registrar.home1.net",
nonce=base64(RAND + AUTN + server specific data), algorithm=AKAv1-MD5,
ik="00112233445566778899aabbccddeeff", ck="ffeeddccbbaa11223344556677889900"
         CSeq: 1 REGISTER
         Content-Length: 0

     (4) SIP/2.0 401 Unauthorized
         Via: SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd];comp=sigcomp;branch=z9hG4bKnashds7
         From:
         To:
         Call-ID:
         WWW-Authenticate: Digest realm="registrar.home1.net",
nonce=base64(RAND + AUTN + server specific data), algorithm=AKAv1-MD5
         Security-Server: ipsec-3gpp; q=0.1; alg=hmac-sha-1-96; spi-c=98765432;
spi-s=87654321; port-c=8642; port-s=7531
         Security-Server: sdes-srtp; mediasec ***new***
         CSeq:
         Content-Length:

     (5) REGISTER sip:registrar.home1.net SIP/2.0
         Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]:
1357;comp=sigcomp;branch=z9hG4bKnashds7
         Max-Forwards: 70
```

```
         P-Access-Network-Info: 3GPP-UTRAN-TDD; utran-cell-
id-3gpp=234151D0FCE11
         From: <sip:user1_public1@home1.net>;tag=4fa3
         To: <sip:user1_public1@home1.net>
         Contact: <sip:[5555::aaa:bbb:ccc:ddd]:
1357;comp=sigcomp>;expires=600000
         Call-ID: apb03a0s09dkjdfglkj49111
         Authorization: Digest username="user1_private@home1.net",
realm="registrar.home1.net", nonce=base64(RAND + AUTN + server specific data),
algorithm=AKAv1-MD5, uri="sip:registrar.home1.net",
response="6629fae49393a05397450978507c4ef1"
         Security-Client: ipsec-3gpp; alg=hmac-sha-1-96; spi-c=23456789; spi-
s=12345678; port-c=2468; port-s=1357
         Security-Verify: ipsec-3gpp; q=0.1; alg=hmac-sha-1-96; spi-c=98765432;
spi-s=87654321; port-c=8642; port-s=7531
```

```
         Security-Client: sdes-srtp; mediasec ***new***
         Security-Verify: sdes-srtp; mediasec ***new***
         Require: sec-agree
         Proxy-Require: sec-agree
         CSeq: 2 REGISTER
         Supported: path
         Content-Length: 0

     (6) REGISTER sip:registrar.home1.net SIP/2.0
         Via: SIP/2.0/UDP pcscf1.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd]:1357;comp=sigcomp;branch=z9hG4bKnashds7
         Max-Forwards: 69
         P-Access-Network-Info:
         Path:
         Require:
         P-Visited-Network-ID:
         P-Charging-Vector:
         From:
         To:
         Contact:
         Call-ID:
         Authorization:
         CSeq:
         Supported:
         Content-Length:

     (7) SIP/2.0 200 OK
         Via: SIP/2.0/UDP pcscf1.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd]:1357;comp=sigcomp;branch=z9hG4bKnashds7
         Path: <sip:term@pcscf1.visited1.net;lr>
         From:
         To:
         Call-ID:
         Contact: <sip:[5555::aaa:bbb:ccc:ddd]:
1357;comp=sigcomp>;expires=600000
         CSeq:
         Date: Wed, 11 July 2001 08:49:37 GMT
         P-Associated-URI: <sip:user1_public2@home1.net>,
<sip:user1_public3@home1.net>, <sip:+1-212-555-1111
begin_of_the_skype_highlighting +1-212-555-1111 FREE
end_of_the_skype_highlighting@home1.net;user=phone>
         Content-Length:

     (8) SIP/2.0 200 OK
         Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]:
1357;comp=sigcomp;branch=z9hG4bKnashds7
         Path:
         From:
```

```
To:
Call-ID:
Contact:
CSeq:
Date:
P-Associated-URI:
Content-Length:
```

Figure 3: Use of mediasec parameter

6.2. Re-Registration 3GPP

Media plane security mechanisms are also exchanged when a registration is refreshed or a new public identity is registered.

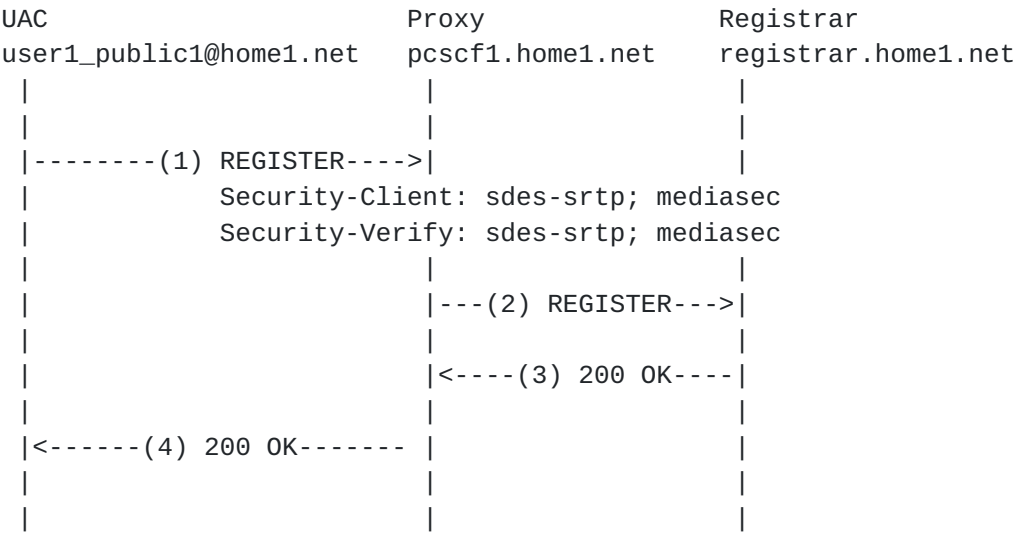


Figure 4: Exchange of Media Security Mechanisms at Re-Registration

The UAC sends a REGISTER request (1) and includes the security mechanisms for the media plane and that it supports in a Security-Client: header field. The UAC also echos the list of security mechanisms it received from the outbound proxy in the Security-Server: header field. Media security mechanisms are distinguished by the "mediasec" header field parameter.

The REGISTER request is forwarded to the registrar (2) and the registrar responds with 200 OK (3), which is forwarded to the UAC (4).

```
   (1) REGISTER sip:registrar.home1.net SIP/2.0
       Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]:
1357;comp=sigcomp;branch=z9hG4bKnashds7
       Max-Forwards: 70
       P-Access-Network-Info: 3GPP-UTRAN-TDD; utran-cell-
id-3gpp=234151D0FCE11
       From: <sip:user1_public1@home1.net>;tag=4fa3
       To: <sip:user1_public1@home1.net>
```

```
         Contact: <sip:[5555::aaa:bbb:ccc:ddd]:
1357;comp=sigcomp>;expires=600000
```

```
         Call-ID: apb03a0s09dkjdfglkj49111
         Authorization: Digest username="user1_private@home1.net",
realm="registrar.home1.net", nonce=base64(RAND + AUTN + server specific
data),     algorithm=AKAv1-MD5, uri="sip:registrar.home1.net",
response="6629fae49393a05397450978507c4ef1", integrity-protected="yes"
         Security-Client: ipsec-3gpp; alg=hmac-sha-1-96; spi-c=23456789; spi-
s=12345678; port-c=2468; port-s=1357
         Security-Client: sdes-srtp; mediasec ***new***
         Security-Verify: ipsec-3gpp; q=0.1; alg=hmac-sha-1-96; spi-c=98765432;
spi-s=87654321; port-c=8642; port-s=7531
         Security-Verify: sdes-srtp; mediasec ***new***
         Require: sec-agree
         Proxy-Require: sec-agree
         CSeq: 3 REGISTER
         Supported: path
         Content-Length: 0


     (2) REGISTER sip:registrar.home1.net SIP/2.0
         Via: SIP/2.0/UDP pcscf1.home1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd]:1357;comp=sigcomp;branch=z9hG4bKnashds7
         P-Access-Network-Info:
         Max-Forwards: 69
         Path:
         Require:
         P-Visited-Network-ID:
         P-Charging-Vector:
         From:
         To:
         Contact:
         Call-ID:
         Authorization:
         CSeq:
         Supported:
         Content-Length:


     (3) SIP/2.0 200 OK
         Via: SIP/2.0/UDP pcscf1.home1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd]:1357;comp=sigcomp;branch=z9hG4bKnashds7
         Path:
         From:
         To:
         Call-ID:
         Contact: <sip:[5555::aaa:bbb:ccc:ddd]:
1357;comp=sigcomp>;expires=600000
         CSeq:
         Date: Wed, 11 July 2001 08:49:37 GMT
```

```
         P-Associated-URI: <sip:user1_public2@home1.net>,
<sip:user1_public3@home1.net>, <sip:+1-212-555-1111
begin_of_the_skype_highlighting +1-212-555-1111 FREE
end_of_the_skype_highlighting@home1.net;user=phone>
         Content-Length:


     (4) SIP/2.0 200 OK
         Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]:
1357;comp=sigcomp;branch=z9hG4bKnashds7
         Path:
         From:
```

```
To:
Call-ID:
Contact:
CSeq:
Date:
P-Associated-URI:
Content-Length:
```

Figure 5: Use of mediasec parameter

6.3. Client Initiated as per RFC 3329

Media plane security mechanisms are also exchanged at client initiated security negotiation described in RFC 3329 [4].

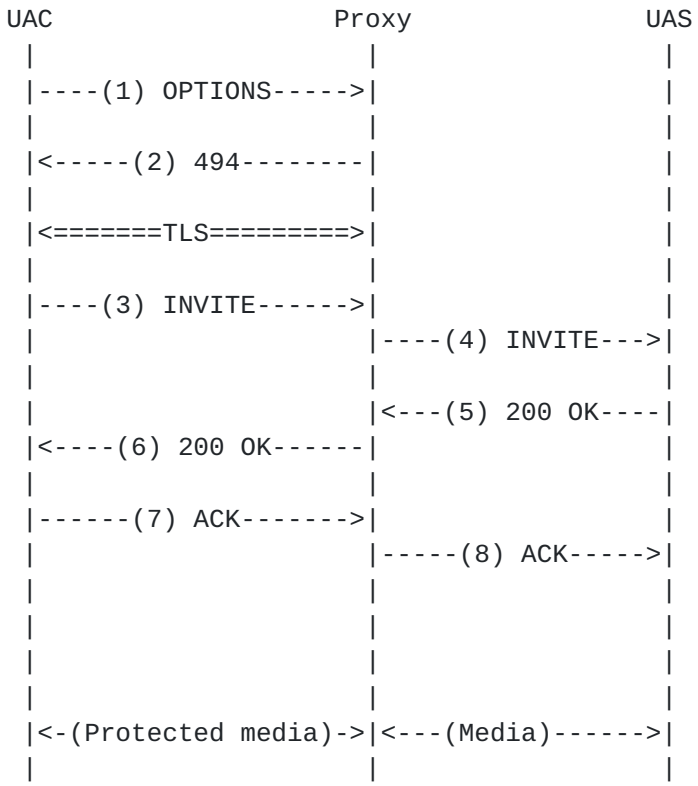


Figure 6: Negotiation Initiated by the Client.

After exchange of security capabilities, the UAC sends an INVITE request(3) including an SDP description of the media plane security to be used (a="e2ae" and a crypto attribute). This INVITE contains a copy of the server's security list in a Security-Verify header field.

The server verifies it, and since it matches its static list, it processes the INVITE and forwards it to the next hop.

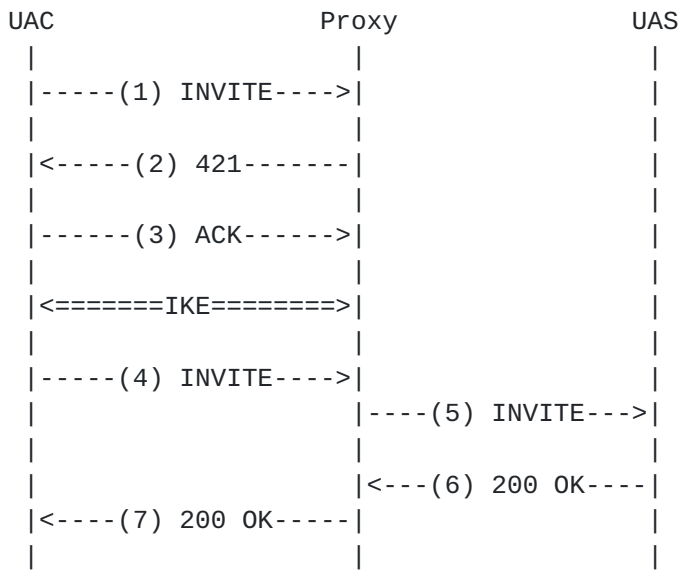
```
(1) OPTIONS sip:proxy.example.com SIP/2.0
    Security-Client: tls
    Security-Client: digest
    Security-Client: sdes-srtp; mediasec
    Require: sec-agree
    Proxy-Require: sec-agree

(2) SIP/2.0 494 Security Agreement Required
    Security-Server: ipsec-ike;q=0.1
    Security-Server: tls;q=0.2
    Security-Server: sdes-srtp; mediasec

(3) INVITE sip:proxy.example.com SIP/2.0
    Security-Verify: ipsec-ike;q=0.1
    Security-Verify: tls;q=0.2
    Security-Verify: sdes-srtp; mediasec
    Route: sip:callee@domain.com
    Require: sec-agree
    Proxy-Require: sec-agree
```

6.4. Server Initiated as per RFC 3329

Media plane security mechanisms are also exchanged at server initiated security negotiation described in RFC 3329 [4].



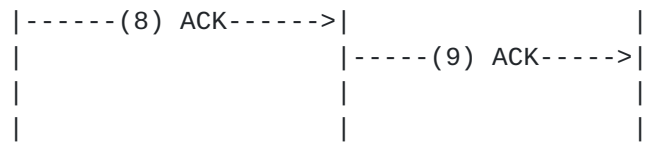


Figure 7: Negotiation Initiated by the Server.

Media security mechanisms are included in Security-Server: and Security-Client: header fields in the same way as signalling security mechanisms.

(1) INVITE sip:uas.example.com SIP/2.0

(2) SIP/2.0 421 Extension Required
    Security-Server: ipsec-ike;q=0.1
    Security-Server: tls;q=0.2
    Security-Server: mechanism; mediasec

(4) INVITE sip:uas.example.com SIP/2.0
    Security-Verify: ipsec-ike;q=0.1
    Security-Verify: tls;q=0.2
    Security-Verify: mechanism; mediasec

Figure 8: Negotiation Initiated by the Server.

6.5. Using Media Plane Security

To request end to access edge media security either on a session or media level the UE sends, for example, an SDP Offer for an SRTP stream containing one or more SDES crypto attributes, each with a key and other security context parameters required according to RFC 4568 [8], together with the attribute "a=3ge2ae".

(3) INVITE sip:bob@ua2.example.com SIP/2.0
Security-Verify: ipsec-ike;q=0.1
Security-Verify: tls;q=0.2
Security-Verify: sdes-srtp;mediasec
Route: proxy.example.com
Require: sec-agree, mediasec
Proxy-Require: sec-agree, mediasec

Via: SIP/2.0/TCP proxy.example.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70

```
From: Alice <sip:alice@ua1.example.com>;tag=9fxced76sl
To: Bob <sip:bob@ua2.example.com>

Call-ID: 3848276298220188511@ua1.example.com
CSeq: 1 INVITE
Contact: <sip:alice@ua1.example.com;transport=tcp>
Content-Type: application/sdp
Content-Length: 285

v=0
o=alice 2890844526 2890844526 IN IP4 ua1.example.com
s=-
c=IN IP4 192.0.2.101
t=0 0
m=audio 49172 RTP/SAVP 0
a=3ge2ae
a=crypto:1 AES_CM_128_HMAC_SHA1_80
    inline:WVNfX19zZW1jdGwgKCkgewkyMjA7fQp9CnVubGVz|2^20|1:4
    FEC_ORDER=FEC_SRTP
a=rtpmap:0 PCMU/8000
```

```
(4) INVITE sip:bob@ua2.example.com SIP/2.0
     Route: sip:proxy.example.com

(5) SIP/2.0  200 OK

(6) SIP/2.0  200 OK
    Security-Server: tls;q=0.2
    Security-Server: sdes-srtp;mediasec
    a=3ge2ae
    a=crypto:1 AES_CM_128_HMAC_SHA1_80
       a=crypto:1 AES_CM_128_HMAC_SHA1_80
       inline:PS1uQCVeeCFCanVmcjkpPywjNWhcYD0mXXtxaVBR|2^20|1:4
```

Figure 9: Using media security

7. Formal Syntax

The following syntax specification uses the augmented Backus-Naur Form (BNF) as described in RFC 5234 [RFC5234].

"mediasec" is a "header field parameter", as defined by [RFC3968].

Header Field Name in which the parameter can appear.

Security-Client

Security-Server

Security-Verify

Header Fields	Parameter Name	Values	Reference
Security-Client	mediasec	No	[this document]
Security-Server	mediasec	No	[this document]
Security-Verify	mediasec	No	[this document]

Name of the Header Field Parameter being registered.

"mediasec"

8. Acknowledgements

Remember, it's important to acknowledge people who have contributed to the work.

This template was extended from an initial version written by Pekka Savola and contributed by him to the xml2rfc project.

9. IANA Considerations

This specification creates a new registry for media plane security mechanisms.

9.1. Registry for Media Plane Security Mechanisms

The IANA has created a subregistry for media plane security mechanism token values to be used with the 'mediasec' header field parameter under the Session Initiation Protocol (SIP) Parameters registry.

Security Mechanism Name for Media	Reference

As per the terminology in [RFC5226], the registration policy for new media plane security mechanism token values shall be 'Specification Required'.

9.2. Registration Template

To: ietf-sip-sec-agree-mechanism-name@iana.org Subject: Registration of a new SIP Security Agreement mechanism

Mechanism Name:

(Token value conforming to the syntax described in Section 4.3.)

Published Specification(s):

(Descriptions of new SIP media plane security agreement mechanisms require a published specification.)

9.3. Header Field Names

This specification registers no new header fields.

9.4. Response Codes

This specification registers no new response codes.

10. Security Considerations

This specification is an extension of RFC 3329 [4] and as such shares the same security considerations.

A further consideration of this specification is protection of the cryptographic key to be used for SRTP and carried in SDP. In order to protect this key, one of the security mechanisms defined in RFC 3329 [4] SHOULD be used in parallel with this specification.

11. References

11.1. Normative References

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11.2. Informative References

[13] Crocker, D., Ed. and P. Overell, "Augmented BNF for Syntax Specifications: ABNF", RFC 4234, October 2005.

[14] Crocker, D., Ed. and P. Overell, "Augmented BNF for Syntax Specifications: ABNF", RFC 2234, November 1997.

Appendix A. Additional stuff

You can add appendices just as regular sections, the only difference is that they go within the "back" element, and not within the "middle" element. And they follow the "reference" elements.

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