Datagram Transport Layer Security (DTLS) Extension to Establish Keys for Secure Real-time Transport Protocol (SRTP)
(Phew!)

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Overview

- SDP signals “I’m willing to do DTLS” (and here’s my fingerprint)
- Do DTLS key exchange in media channel
  - Allows reuse of existing DTLS authentication/key establishment mechanisms
  - Use extensions to negotiate SRTP protection profiles
- Use DTLS master secret to generate SRTP traffic keys

TLS Handshake Extension

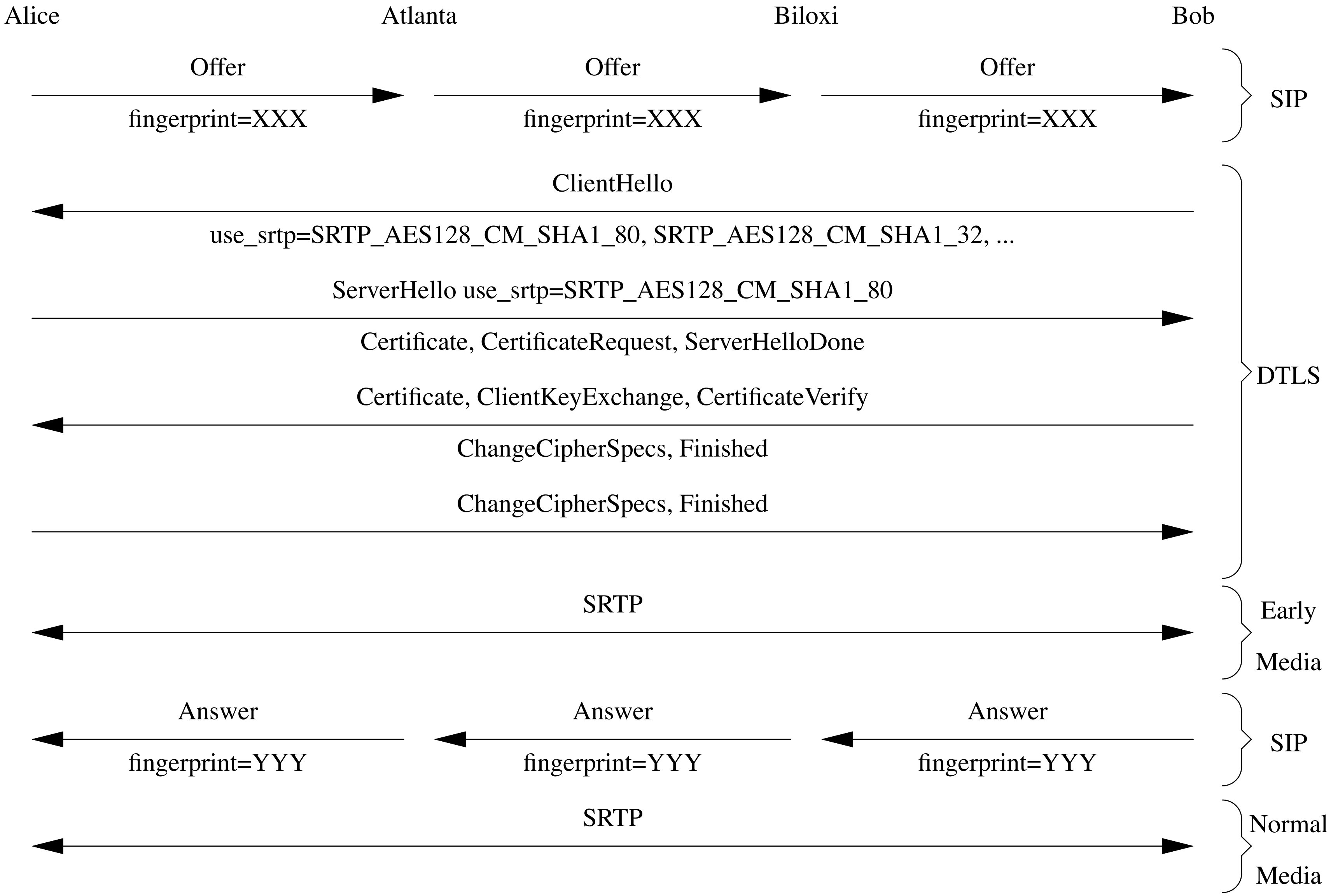
```
uint8 SRTPProtectionProfile[2];

struct {
   SRTPProtectionProfiles SRTPProtectionProfiles;
   uint8 srtp_mki<255>;
} UseSRTPData;

SRTPProtectionProfile SRTPProtectionProfiles<2^16-1>;

SRTPProtectionProfile SRTP_AES128_CM_SHA1_80 = {0x00, 0x01};
SRTPProtectionProfile SRTP_AES128_CM_SHA1_32 = {0x00, 0x02};
SRTPProtectionProfile SRTP_AES256_CM_SHA1_80 = {0x00, 0x03};
SRTPProtectionProfile SRTP_AES256_CM_SHA1_32 = {0x00, 0x04};
SRTPProtectionProfile SRTP_NULL_SHA1_80      = {0x00, 0x05};
SRTPProtectionProfile SRTP_NULL_SHA1_32      = {0x00, 0x06};
```

Message Flow



Alice

Atlanta

Biloxi

Bob

Offer

fingerprint=XXX

Offer

fingerprint=XXX

Offer

fingerprint=XXX

SIP

ClientHello

use_srtp=SRTP_AES128_CM_SHA1_80, SRTP_AES128_CM_SHA1_32, ...

ServerHello use_srtp=SRTP_AES128_CM_SHA1_80

Certificate, CertificateRequest, ServerHelloDone

Certificate, ClientKeyExchange, CertificateVerify

ChangeCipherSpecs, Finished

ChangeCipherSpecs, Finished

DTLS

SRTP

Early Media

Answer

fingerprint=YYY

Answer

fingerprint=YYY

Answer

fingerprint=YYY

SIP

SRTP

Normal Media

Transporting DTLS Handshake Traffic

- Current draft:
  - Carried over same channel as media
  - Directly over UDP
  - Demuxable from RTP/STUN by first byte (S 3.6.2)
  - One DTLS connection per media stream
- Other alternatives
  - In RTCP channel
  - Header extension (a la ZRTP)

Requirements Evaluation

R1: Forking and retargeting MUST work with all end-points being SRTP.	Yes
R2: Forking and retargeting MUST allow establishing SRTP or RTP with a mixture of SRTP- and RTP-capable targets.	Yes
R3: With forking, only the entity to which the call is finally established, MUST get hold of the media encryption keys.	Yes (separate key exchange to each peer)
R5: A solution SHOULD avoid clipping media before SDP answer without additional signalling.	Yes
R6: A solution MUST provide protection against passive attacks.	Yes (including malicious proxies)
R7: A solution MUST be able to support Perfect Forward Secrecy.	Yes (DHE modes)
R8: A solution MUST support algorithm negotiation without incurring per-algorithm computational expense.	Yes (cipher suites negotiated first)
R9: A solution MUST support multiple cipher suites without additional computational expense	Yes
R10: Endpoint identification when forking. The Offerer must be able to associate answer with the appropriate flow endpoint. In case of forking one might not want to perform a DH with every party but instead to associate the SDP response with the right end point. This is a performance related requirement.	Yes (but latency tradeoff)
R11: A solution MUST NOT require 3rd-party certs. If two parties share an auth infrastructure they should be able to use it.	Yes (fingerprints but 3rd-party certs are usable)

Current status

- Bunch of drafts
  - draft-mcgrew-tls-srtp-00, draft-fischl-sipping-media-dtls-00, draft-fischl-mmusic-sdp-dtls-00
  - Looking for feedback
- Prototype implementations in OpenSSL and EyeBeam (thanks Derek MacDonald, Dragos Liciu, Jason Fischl, Nagendra Modadugu)

Open issue: transporting key management messages

- An issue for any media-plane key management protocol
- RTCP channel
  - Natural fit for RTP style
  - But deployment of RTCP is spotty
- RTP header extension
  - No dependency on RTCP
  - Not what header extension intended for
- Carried directly over UDP—demuxed like STUN
  - Keeps key management out of media packets
  - Is this a good fit for the RTP style?