Overview of SIP Media Security Options

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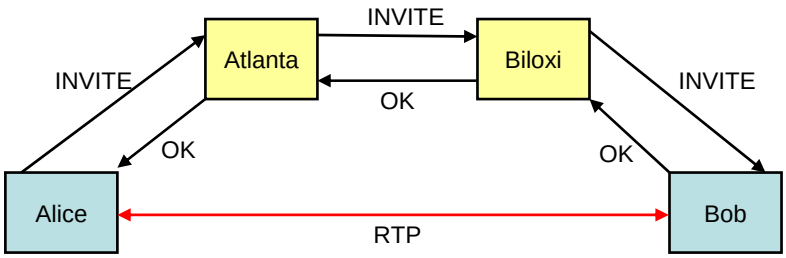
Reminder: Basic Topology



- SIP and RTP follow different paths
  - SIP: Signaling path
  - RTP: Media path
- Media path is often faster (fewer hops)

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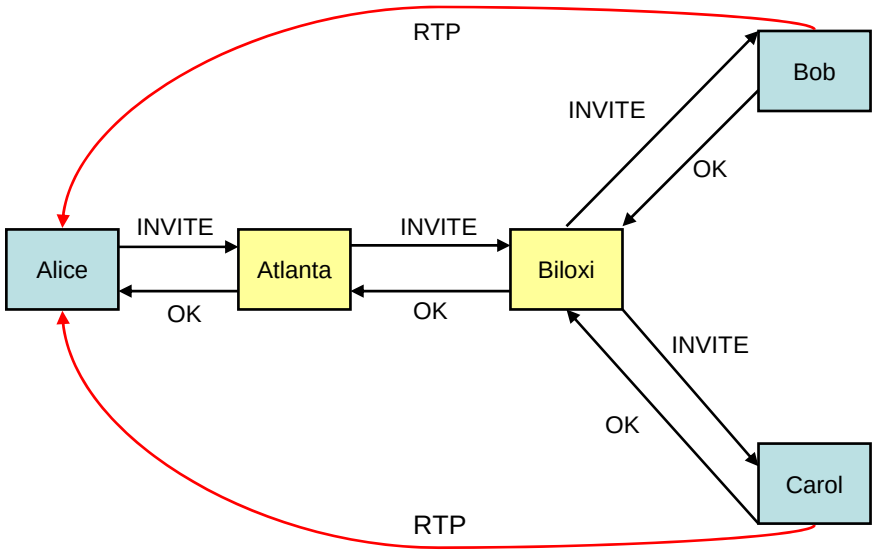
Forking



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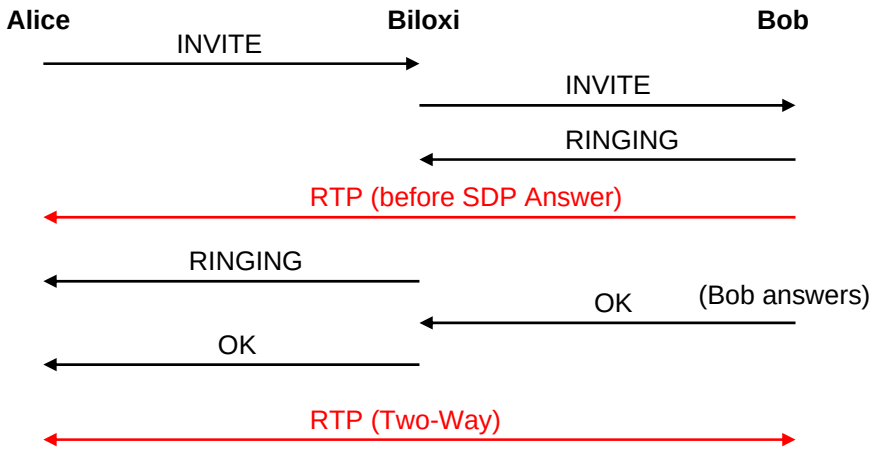
Media Before SDP Answer ("Clipping")



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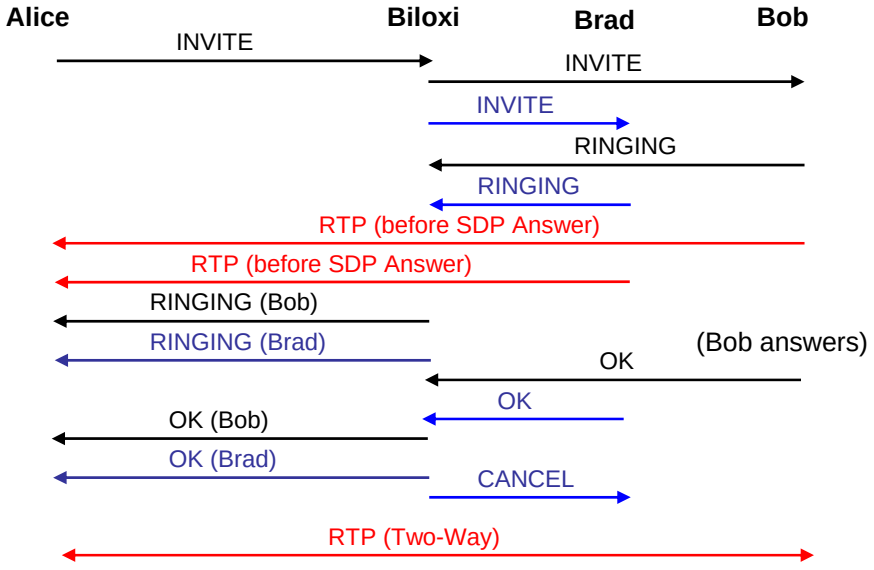
Forking with Media Before SDP Answer



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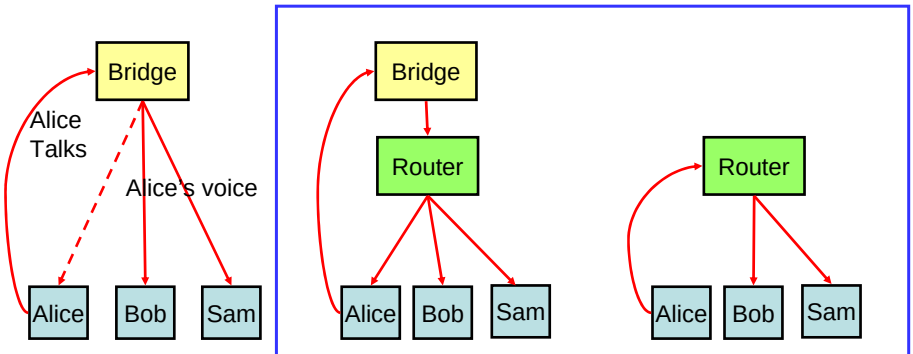
Conferencing Architectures



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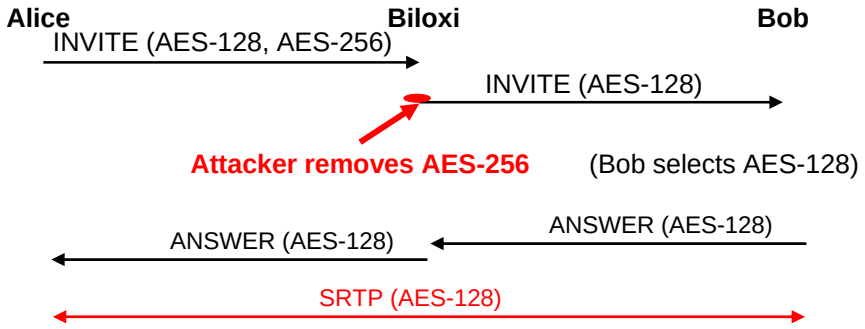
Bid-Down Attack



- Bid down SRTP encryption level
- Bid down to RTP (mult/alt, SDP grouping)

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Secure RTP

- Channel security is well understood
  - Techniques documented in RFC3711
- Problem is association management
  - Key establishment
  - Peer authentication
  - Algorithm selection
- This means some kind of handshake

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Overall design choices

- Handshake in signaling channel
  - MIKEY, Security Descriptions
  - Already written up and implemented
  - Problems with forking and media-before-SDP-answer
- Handshake in media channel
  - ZRTP, EKT, RTP/DTLS
  - Internet Drafts only
  - Work well with forking and media-before-SDP-answer

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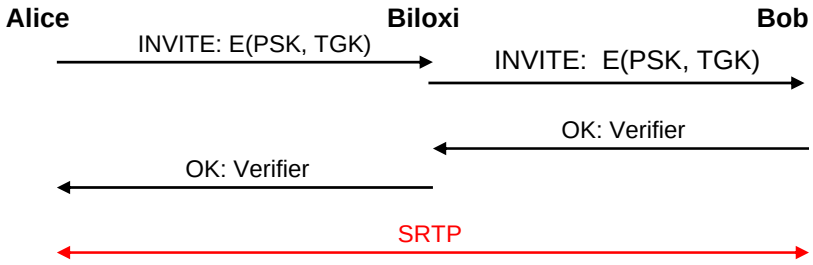
MIKEY Pre-Shared Key Mode (3830)



Requires signalling confidentiality	No
Forking	No
Media before SDP answer	Yes
Shared-key conferencing	Yes
Requires PKI	No (but pre shared key)
Rekeying	Yes
Downgrade attack protection	Yes

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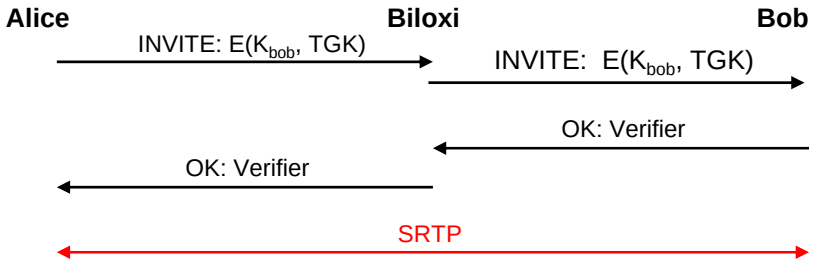
MIKEY Public Key Mode (3830)



Requires signalling confidentiality	No
Forking	No
Media before SDP answer	Yes
Shared-key conferencing	Yes
Requires PKI	Yes
Rekeying	Yes
Downgrade attack protection	Yes

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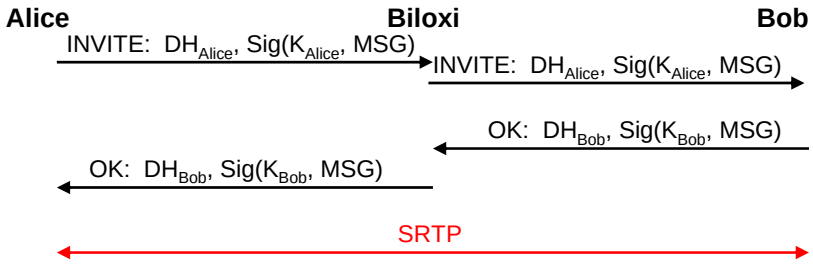
MIKEY Diffie-Hellman Mode (3830)



Requires signalling confidentiality	No
Forking	No
Media before SDP answer	No
Shared-key conferencing	No
Requires PKI	Yes
Rekeying	Yes
Downgrade attack protection	Yes

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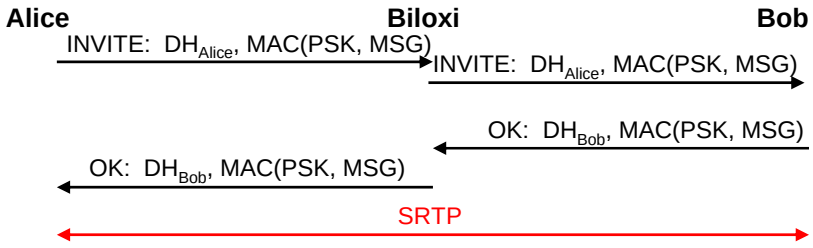
MIKEY Diffie-Hellman HMAC Mode (draft-ietf-msec-mikey-dhhmac-11)



Requires signalling confidentiality	No
Forking	No
Media before SDP answer	No
Shared-key conferencing	No
Requires PKI	No (pre-shared key)
Rekeying	Yes
Downgrade attack protection	Yes

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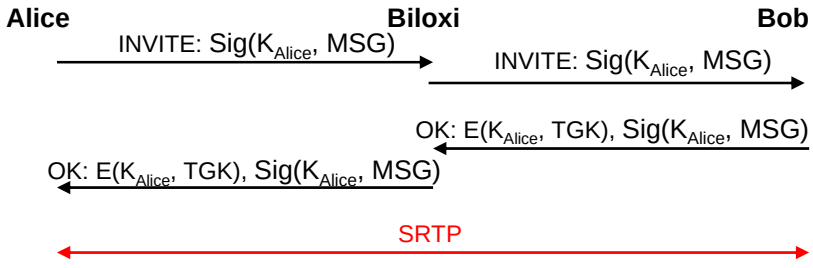
MIKEY RSA-R Mode (draft-ietf-msec-mikey-rsa-r-02)



Requires signalling confidentiality	No
Forking	Yes
Media before SDP answer	No
Shared-key conferencing	Yes
Requires PKI	Yes
Rekeying	Yes
Downgrade attack protection	Yes

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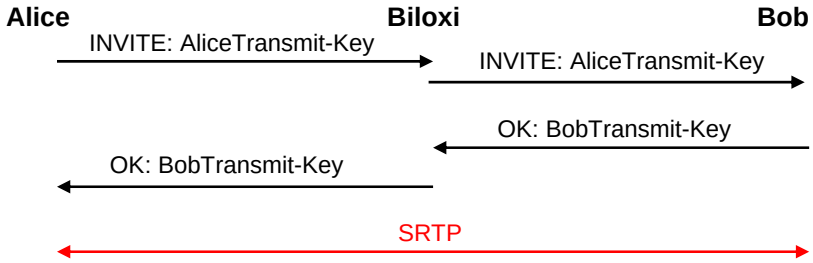
SDESCRIPTIONS (draft-ietf-mmusic-sdescriptions-12)

dwing5



Requires signalling confidentiality	Yes
Forking	Yes (insecure)
Media before SDP answer	No
Shared-key conferencing	Yes
Requires PKI	No
Rekeying	Yes (New Offer)
Downgrade attack protection	No

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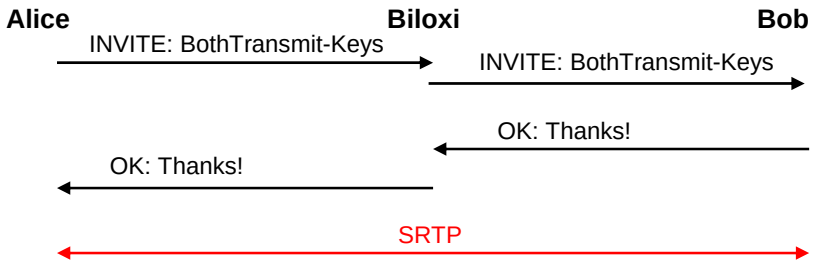
SDES Early Media Mode (draft-wing-mmusic-sdes-early-media-00)



Requires signalling confidentiality	Yes
Forking	Yes (insecure)
Media before SDP answer	Yes
Shared-key conferencing	Yes
Requires PKI	No
Rekeying	Yes (New Offer)
Downgrade attack protection	No

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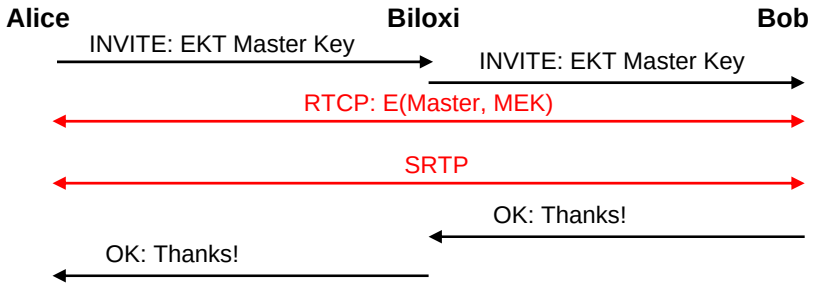
dwing5 "SDES Mode" -> "sdescriptions"
Dan Wing; 08.03.2006

Encrypted Key Transport w/ SDES (draft-mcgrew-srtp-ekt-00)



	In SDES mode
Requires signalling confidentiality	Yes (insecure)
Forking	Yes
Media before SDP answer	Yes
Shared-key conferencing	No
Requires PKI	Yes
Rekeying	Depends on base handshake
Downgrade attack protection	

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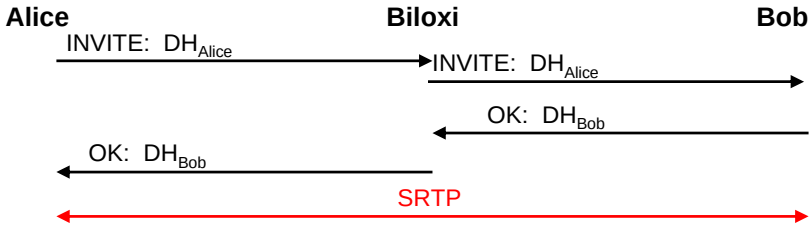
SDP DH Mode (draft-baugher-mmusic-sdp-00)



Requires signalling confidentiality	No
Forking	No
Media before SDP answer	No
Shared-key conferencing	No
Requires PKI	No
Rekeying	No
Downgrade attack protection	No

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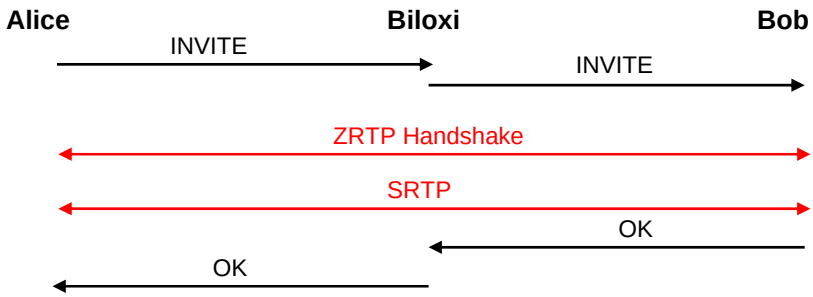
ZRTP (draft-zimmermann-avt-zrtp-01)



Requires signalling confidentiality	No
Forking	Yes
Media before SDP answer	Yes
Shared-key conferencing	No
Requires PKI	No
Rekeying	Yes
Downgrade attack protection	Yes

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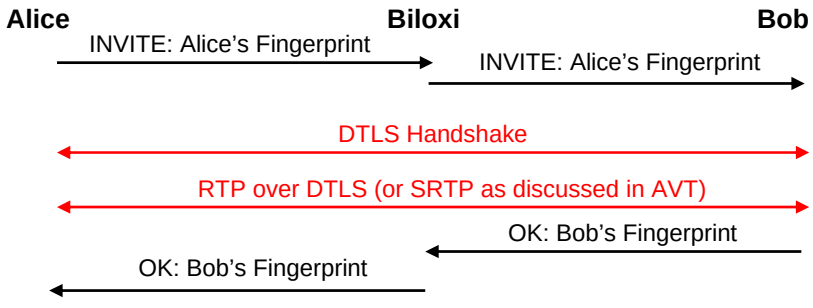
DTLS/RTP (draft-tschofenig-avt-rtp-dtls-00, etc.)



Requires signalling confidentiality	No
Forking	Yes
Media before SDP answer	Yes
Shared-key conferencing	No
Requires PKI	No
Rekeying	Yes
Downgrade attack protection	Yes

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Summary Table

	Sig. Conf.	Forking	Media before Answer	Shared -key conf.	PKI?	Rekey	Bid-down protection
MIKEY-PSK	No	No	Yes	Yes	No*	Yes	Yes
MIKEY-RSA	No	No	Yes	Yes	Yes	Yes	Yes
MIKEY-DH	No	No	No	No	Yes	Yes	Yes
MIKEY-DHHMAC	No	No	No	No	No*	Yes	Yes
MIKEY-RSA-R	No	Yes	No	Yes	Yes	Yes	Yes
SDES	Yes	Yes*	No	Yes	No	Yes*	No
SDES-EM	Yes	Yes*	Yes	Yes	No	Yes	No
EKT	Yes*	Yes*	Yes	Yes	No	Yes	*
SDP-DH	No	No	No	No	No	No	No
ZRTP	No	Yes	Yes	No	No	Yes	Yes
DTLS	No	Yes	Yes	No	No	Yes	Yes

Architecture: Key Exchange: Signalling or Media Path?

- Signalling (SDP, SIP)
  - Already standardized
    - MIKEY/kmgmt-ext, Security Descriptions
  - Problems with
    - Media-before-SDP-Answer, forking
- Media path
  - Internet Drafts only
    - Pure inline
      - ZRTP
    - Hybrid
      - EKT (key exchange using security descriptions)
      - DTLS/RTP (fingerprints in SDP)
  - Better coordination with media protection
  - Changes RTP architecture

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Architecture: Authenticating the Association

- Through external PKI
  - This seems problematic
- Through security of signalling channel
  - Confidentiality (TLS, S/MIME)
  - Integrity only
- Voice authentication
- Protocols more flexible than specified
  - Could use ZRTP with fingerprints, MIKEY-DH with voice authentication, MIKEY-DH w/o certificate validation, etc.
  - Not really a function of handshake but of design style
    - With some exceptions

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Discussion Topics

- Importance of:
  - Media before SDP answer (“clipping”)
  - Secure Forking
  - Shared-Key Conferencing
- Interoperable SRTP Keying is Desirable ?
- Architecture Choices
  - Key Exchange: Signaling / Media Path
  - PKI

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List of documents

RFC 3830 (MIKEY)
RFC 3711 (SRTP)
draft-ietf-mmusic-kmgmt-ext-15
draft-ietf-mmusic-sdescriptions-12

draft-ietf-msec-mikey-rsa-r-02
draft-ietf-msec-mikey-dhhmac-11
draft-ietf-msec-newtype-keyid-05
draft-mcgrew-srtp-ekt-00
draft-baugher-mmusic-sdp-dh-00
draft-zimmermann-avt-zrtp-01
DTLS:
- draft-tschofenig-avt-rtp-dtls-00
- draft-fischl-sipping-media-dtls-00
- draft-fischl-mmusic-sdp-dtls-00
- draft-rescorla-tls-partial-00
- draft-modadugu-dtls-short-00

draft-lehtovirtya-srtp-rcc-00
draft-fries-msec-applicability-00
draft-wing-mmusic-sdes-early-media-00 (expired)

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