# MACSec Security Service FIPS Validation

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# Topics

- MACSec Overview
- MACSec Authentication Mechanisms
- MACSec with FIPS
- Draft IG A.5
- References
- Q&A

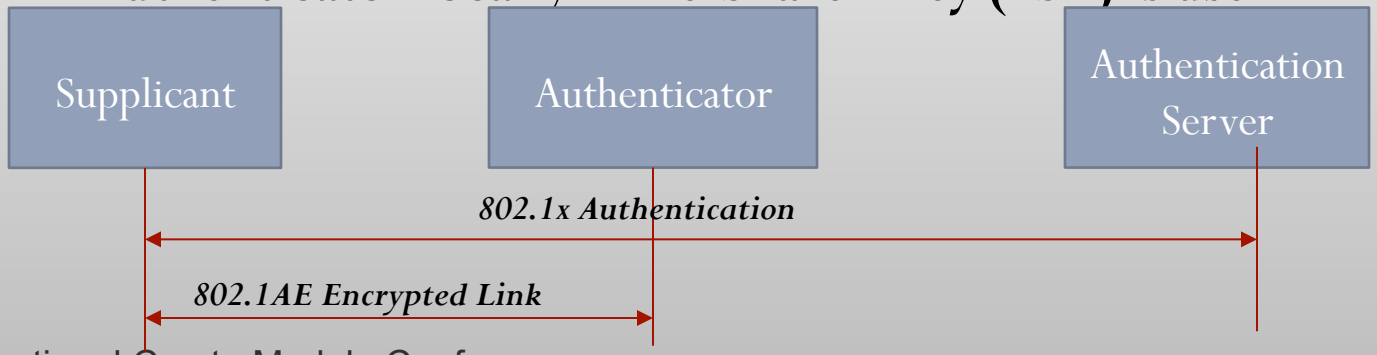
# MACSec Overview

- **What is MACSec?**
  - **Media Access Control Security (aka MACSec) is the IEEE 802.1AE standard for authenticating and encrypting packets between two MACsec-capable devices.**

- **Why MACSec?**
  - **Layer 2 (not layer 3) data encryption (AES-128/256 GCM)**
  - **Integrity Check**
  - **Denial of service (DoS) attack isolation**
  - **Others**

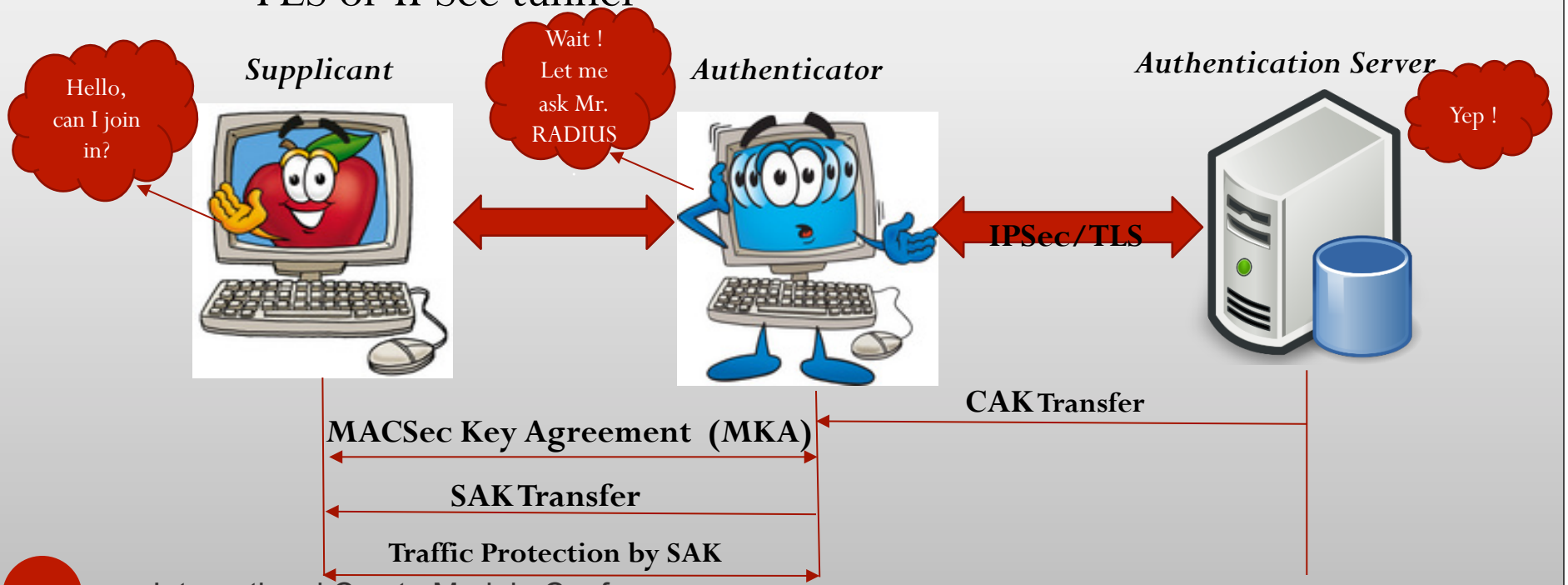
# MACSec Overview (Cont.)

- **MACSec Components**
  - **Suppliant**
  - **Authenticator**
  - **Authentication Server**
    - **EAP Authentication Mode: Authentication is done via the RADIUS Server if Extensible Authentication Protocol (EAP) is used**
    - **PSK Authentication Mode: Authentication is done in the Authenticator locally if Pre-Shared Key (PSK) is used**



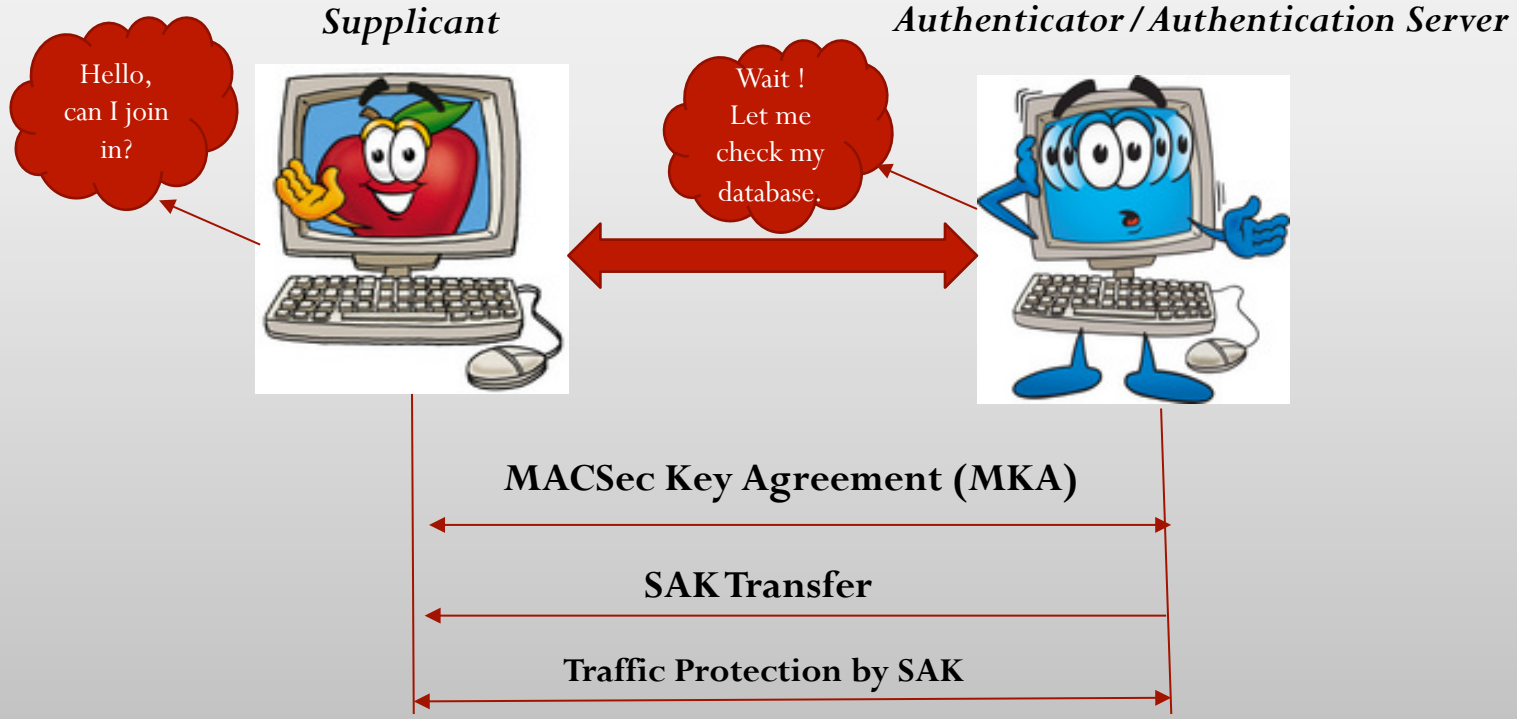
# MACSec Authentication

- **Authentication using EAP method**
  - EAP-TLS Authentication
  - RADIUS Server
  - TLS or IPSec tunnel



# MACSec Authentication (Cont.)

- **Authentication using PSK method**
  - Pre-shared Key (PSK) Authentication
  - No RADIUS Server



# So is my MACSec Okay for FIPS?

- **MACSec Cryptographic Keys**
  - **PSK – Pre-shared Key (in PSK Mode)**
  - **MSK - Master Session Key (in EAP Mode)**
  - **CAK - Connectivity Association Key**
  - **CKN - Connectivity Association Key Name (used to identifies the CAK).**
  - **KEK – Key encryption key**
  - **ICK - Integrity Check Key**
  - **SAK – MACSec Secure Association Key**

# MACSec for FIPS (Cont.)

- **MACSec Keys Establishment**
  - **PSK – Pre-shared Key (PSK Mode)**
    - **Entered by Admin/Crypto Officer**
  - **MSK - Master Session Key (EAP Mode)**
    - **Derived from EAP session (802.1x-2010)**
  - **CAK - Connectivity Association Key**
    - **CAK = KDF(Key, Label, mac1 | mac2, CAK length)**
    - **Derived from MSK**
    - **IEEE 802.1x-2010, Section 6.2.2**

# MACSec for FIPS (Cont.)

- **MACSec Keys Establishment**
  - **CKN - Connectivity Association Key Name (used to identifies the CAK)**
    - **CKN = KDF(Key, Label, ID | mac1| mac2, CKN length)**
    - **Derived from MSK**
    - **KDF: SP800-108 KDF (NIST Approved)**
    - **IEEE 802.1x-2010, Section 6.2.2**
  - **KEK – Key Encryption Key**
    - **KEK = KDF(Key, Label, Keyid, KEK Length)**
    - **Derived from CAK**
    - **KDF: SP800-108 KDF (NIST Approved)**
    - **IEEE 802.1x-2010, Section 9.3.3**

# MACSec for FIPS (Cont.)

- **MACSec Keys Establishment**
  - **ICK – Integrity Check Key**
    - **ICK = KDF(Key, Label, Keyid, ICKLength)**
    - **Derived from CAK**
    - **KDF: SP800-108 KDF (NIST Approved)**
    - **IEEE 802.1x-2010, Section 9.3.3**
  - **SAK - MACSec Secure Association Key**
    - **SAK Establishment**
      - **Option 1: Generated by the Authenticator (SP800-133 Key Generation)**
      - **Option 2: Derived from CAK**
      - **IEEE 802.1x-2010, Section 9.8.1**

# MACSec for FIPS (Cont.)

- **SAK Key Transfer**
  - **FIPS Approved Key Transport Method**
    - **RSA-based key transport scheme, as specified in SP 800-56B.**
    - **Approved key wrapping algorithms are specified in SP 800-38F.**
  - **FIPS Approved Key Transport Method (before Dec. 31, 2017):**
    - **Any key encapsulation scheme employing an RSA-based key methodology that uses an RSA modulus that is at least 2048 bits long.**
    - **A key wrapping using any approved mode of AES or three-key Triple-DES**

# Draft A.5 Requirements for MACSec

- Still in Draft since last modified (5/13/2016)
- EAP Mode
  - IPSec/TLS secure tunnel in MACSec deployment
  - IV generation method in IPSec/TLS meets the A.5 requirements.
- PSK Mode
  - PSK can be used as CAK
  - PSK shall not be directly used as SAK
- IV Generation requirement in MACSec???
- SP800-108 KDF
- Check the lab for the A.5 update status.

# References


- IEEE 802.1x-2010
- SP800-38D
- SP800-108 KDF
- FIPS Implementation Guidance (IG)/A.5
- Identity-Based Networking Services: MAC Security (http://www.cisco.com/c/en/us/products/collateral/ios-nx-os-software/identity-based-networking-services/deploy_guide_c17-663760.pdf)
- Introduction to WAN MACsec and Encryption Positioning (https://clnv.s3.amazonaws.com/2015/usa/pdf/BRKRST-2309.pdf)
- Understanding Media Access Control Security (MACsec) (https://www.juniper.net/documentation/en_US/junos13.2/topics/concept/macsec.html)

# Questions and Answer

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