

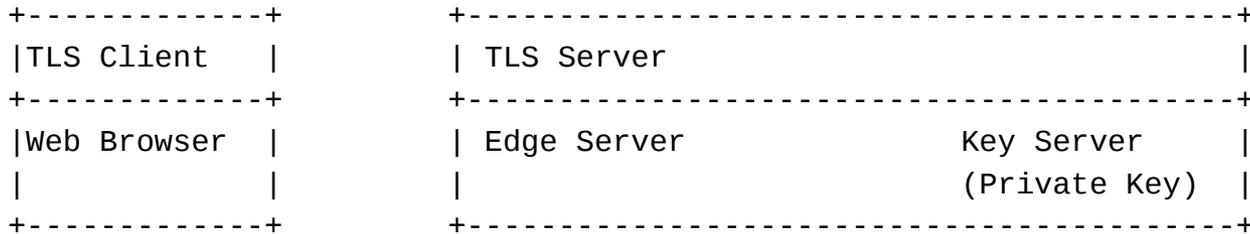
Lurk - BoF

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Toc

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 - Case of RSA
 - Case of ECDHE_ECDSA
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 - LURK Implementation
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TLS Authentication with LURK



ClientHello ----->
Cipher_suite

<----- ServerHello
Cipher_suite (Selected)

<===== LURK =====>

--- [Remaining TLS Handshake] ---

Cipher_suite examples:

- TLS_RSA_WITH_AES_256_CBC_SHA256
- TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA
- TLS_DH_RSA_WITH_AES_256_CBC_SHA256
- TLS_DH_anon_WITH_AES_256_CBC_SHA25
- TLS_DHE_RSA_WITH_AES_256_CBC_SHA256

TLS Authentication with LURK

- TLS authentication methods:

- RSA

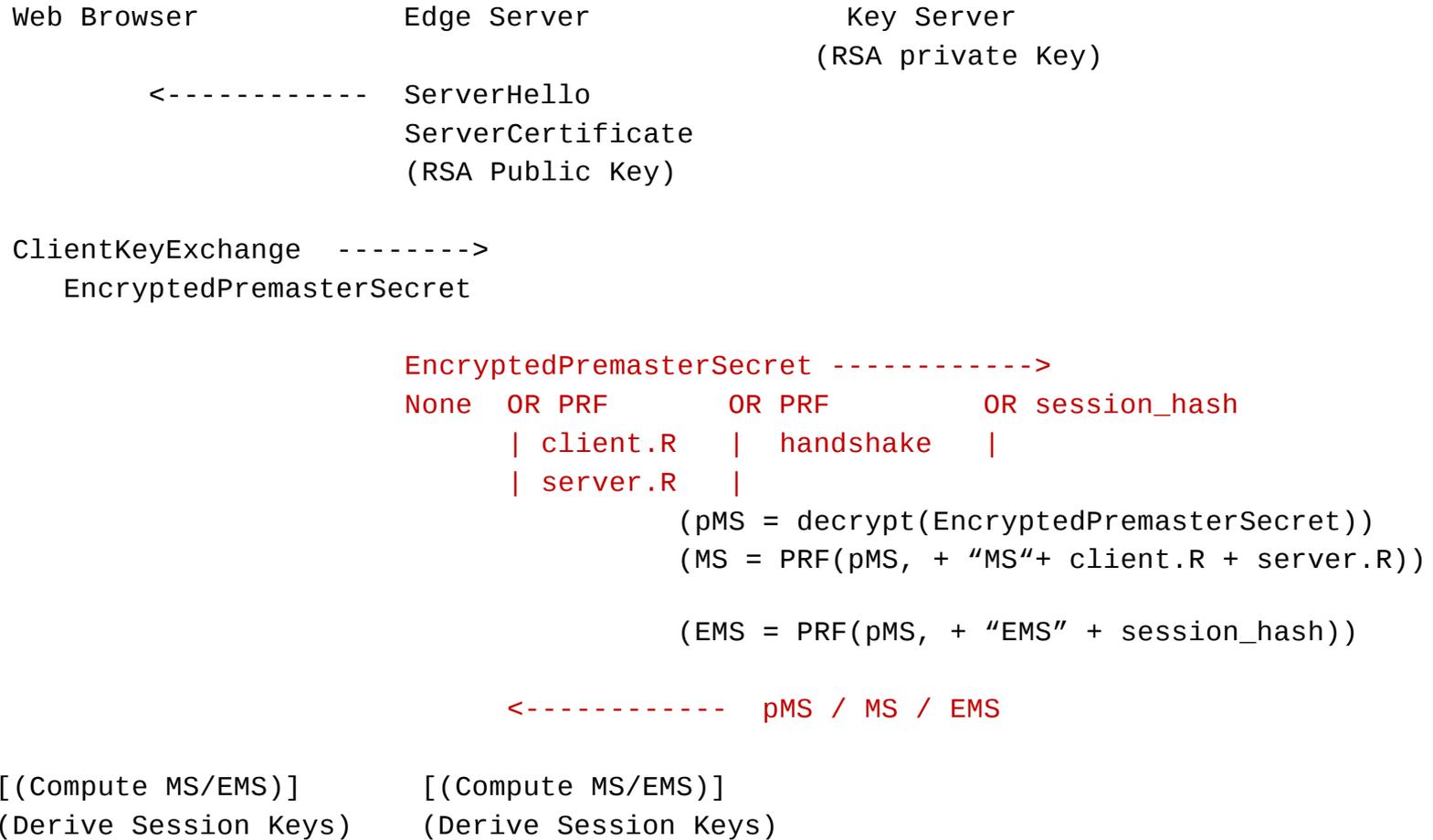
- DH_DSS, DH_RSA, ECDH_ECDSA, ECDH_RSA

- DH_anon, ECDH_anon

- DHE_DSS, DHE_RSA, ECDHE_RSA, ECDHE_ECDSA

- PSK, DHE_PSK, RSA_PSK

RSA Model



Discussion: Limiting Outputs to (E)MS

- Returning a pre Master Secret:
 - Pro: Universal interface as MS/EMS are derived from the premaster
 - Con: PMS makes the Key Server an open oracle
- Returning a Master Secret / Ext MS:
 - Pro: needs some context of a TLS connection establishment
 - Pro: Keep the premaster secret from the Edge Server
 - Would reduce vulnerability in case the premaster is re-used.
 - Pro: Protects the Key Server from chosen cipher text attack, and leakage of RSA private key
 - Con: requires different implementation for the MS/EMS
- Any opinion on limiting outputs to MS and EMS ?

Discussion: Limiting EMS Input to sH

- ~~Output is premaster:~~
 - Encrypted Premaster Master
 - Output is Master Secret:
 - Encrypted Premaster Master
 - PRF
 - {Server/Client}Hello.random
 - Output is Extended Master Secret
 - Encrypted Premaster Master
 - PRF
 - Session_hash
- OR
- ~~Encrypted Premaster Master~~
 - PRF
 - Handshake_message
 - Hash
- Which inputs for the EMS:
 - Session_hash
 - Pro: limited overhead
 - Con: provides little TLS context (opaque value)
 - handshake_message
 - Pro: provides a better context
 - Con: significant network overhead
 - Con: significantly complex parameters checks at the Key Server

- Any opinion on only considering the session_hash ?

ECDHE_ECDSA

Web Browser

Edge Server

Key Server
(ECDSA private Key)

ClientHello ----->
Supported Elliptic Curves Extension
Supported Point Formats Extension

ServerECDHParams OR hash ----->
client.R |
server.R |
H |

H(client.R + server.R + ECDHParams)
<----- Signature

<----- ServerHello
Supported Point Formats Extension
Certificate
ServerKeyExchange
ECPParameters (ECDH Public key)
Signature (ECDSA)

ClientKeyExchange ----->
ClientECDiffieHellmanPublic (ECDH Public key)
(Compute ECDH) (Compute ECDH)
(Compute EMS/ MS) (Compute MS / EMS)

Discussion: Input Parameters

- Input can be:
 - Hash function
 - ServerHello.random
 - ClientHello.random
 - ServerKeyExchange.params
- OR
- Resulting hash
- Any opinion on providing all parameters?

Discussion: Output Signature Format

- TLS1.3 proposes DigitallySigned structure

```
struct {  
    SignatureScheme algorithm;  
    opaque signature<0..2^16-1>;  
} DigitallySigned;
```

- TLS1.3 propose to replace RSASSA-PKCS1-v1_5 by RSA-PSS
- Any opinion on adopting TLS1.3 structures and format for LURK?

LURK Protocol

- LURK Implementation design:
 - Minimal MTI set of authentication methods (ECDHE)
 - Extensible for any other authentication method
- Notes:
 - None of the authentication method is incompatible with LURK
 - Minimal MTI should consider:
 - Non deprecated authentication methods
 - Deployed
 - We can still update later and deprecate non used authentication methods

LURK Protocol

- Type of Exchange:
 - Cryptographic Oriented Exchanges
 - Additional Exchange
 - Edge Server Listing Capabilities (supported extensions)
 - Keep Alive
 - Extra Information provided to the Edge Server
 - Checking the public key hosted on the Edge Server
 - ...

LURK Cryptographic Exchange

- LURK Client Input parameters:
 - Static parameters
 - LURK version
 - TLSVersion
 - ObjectRequest:
 - ~~premaster~~ / master / signature
 - AuthenticationMethod
 - rsa, dh_dss, dh_rsa, dh_dss, dh_rsa, ecdh_rsa, dh_anon, ecdh_anon, dhe_dss, dhe_rsa, ecche_ecdsa, ecche_rsa, psk, dhe_psk, rsa_psk
 - MasterMethod
 - ms, emas_from_session_hash, ~~emas_from_handshake~~
 - SignatureMethod
 - rsa, dss, ecdsa
 - PRF
 - TLS Handshake parameters
 - Client/ServerHello.random
 - Session_hash, data_hash
 - Handshake_message
 - PSK_id
 - Cryptographic parameters
 - RSAEncryptedPreMaster
 - DHECDHEEdgeServerDHECDHEParams
 - TLSClientDHECDHPublicKey
 - Should we indicate the private key concerned ?

LURK Cryptographic Exchange

- LURK Client Output parameters:
 - ~~PreMaster~~ :
opaque random[46]
 - Master/EMaster:
opaque random[48]
 - Signature
struct {
 SignatureScheme algorithm;
 opaque signature<0..2¹⁶-1>;
} DigitallySigned;
 - Error

LURK Cryptographic Exchange

- Type of Error:
 - Incoherence between Input parameters:
 - Ex: authentication method = rsa and object request = signature
 - ~~TLSVersion and RSAEncryptedPreMaster~~
 - Unsupported Input parameters
 - Ex: authentication method = psk
 - Operations Errors:
 - Should not be provided (decryption)
 - It should be logged
 - DOTS should generate an alarm (outside LURK)

LURK Implementation

- A single implementation:
 - Current structures are really TLS oriented
 - HTTPS/JSON ?
 - HTTPS/CBOR ?
 - New packet format ?

LURK drafts

- [draft-mglt-lurk-tls-use-cases](#)
 - describes the use case
- [draft-mglt-lurk-tls-requirements](#)
 - ALL authentication method
 - Describe Split Authentication
 - Provide Security Requirements for Split Authentication
 - Provides a Security Analysis of Split Authentication
- [draft-cairns-tls-session-key-interface](#)
 - Describes the architecture
 - Implementation for RSA/(EC)DHE* based on JSON
- [draft-mglt-lurk-tls-abstract-api](#)
 - Describes interactions between the Edge Server / Key Server
 - Does not describe the payload format... yet!

Thank you!