TLS – Cached Information

Stefan Santesson

3xA Security

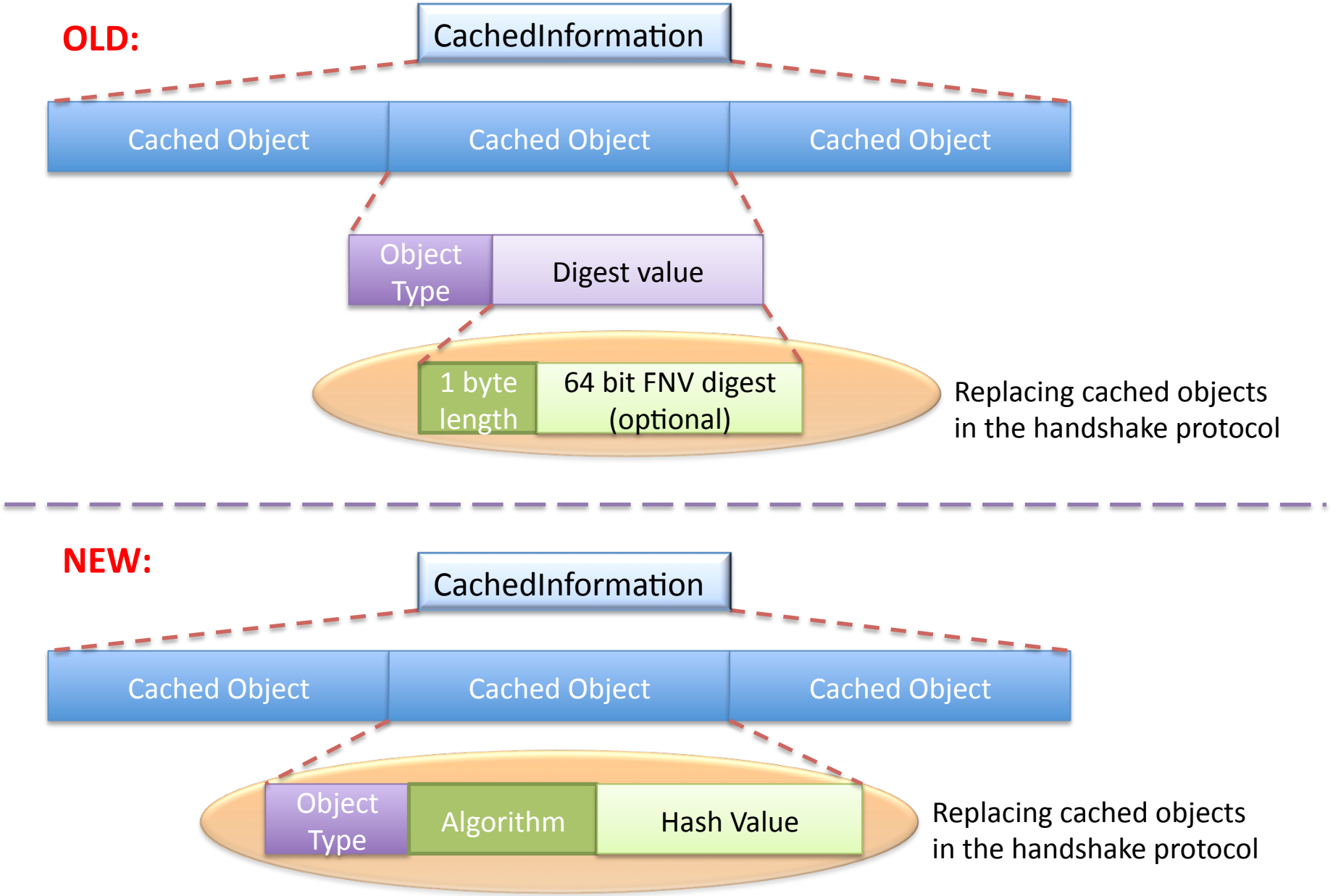
(http://AAA-sec.com)

Status

- Summary past discussions
  - Problems related to use of hash algorithms
    - Agility complexity
    - Need to specify a must implement hash for interoperability
    - No strong security requirements
  - Problems related to use of FNV
    - Does not preserve security properties of Finished calculations
  - Problems related to use of Finished message hash function
    - TLS 1.0 and TLS 1.1 use a combination of MD5 and SHA-1.
    - No hash identifier for TLS prf.

Major changes in draft 09

- All use of FNV-1 digest replaced with hash used in Finished calculation of cached handshake
  - Problem: This does only work for TLS 1.2
- Reconnaissance updated
  - Client may check server capability before caching
- Updated substitution syntax for each cached information type
  - Preserving original handshake message syntax


OLD:
CachedInformation
Cached Object
Cached Object
Cached Object
Object Type
Digest value
1 byte length
64 bit FNV digest (optional)
Replacing cached objects in the handshake protocol
NEW:
CachedInformation
Cached Object
Cached Object
Cached Object
Object Type
Algorithm
Hash Value
Replacing cached objects in the handshake protocol

Extension syntax

Old

```
enum {
      certificate_chain(1), trusted_cas(2),
      (255)
} CachedInformationType;

struct {
      CachedInformationType type;
      opaque digest_value<0..8>;
} CachedObject;

struct {
      CachedObject cached_info<1..2^16-1>;
} CachedInformation;
```

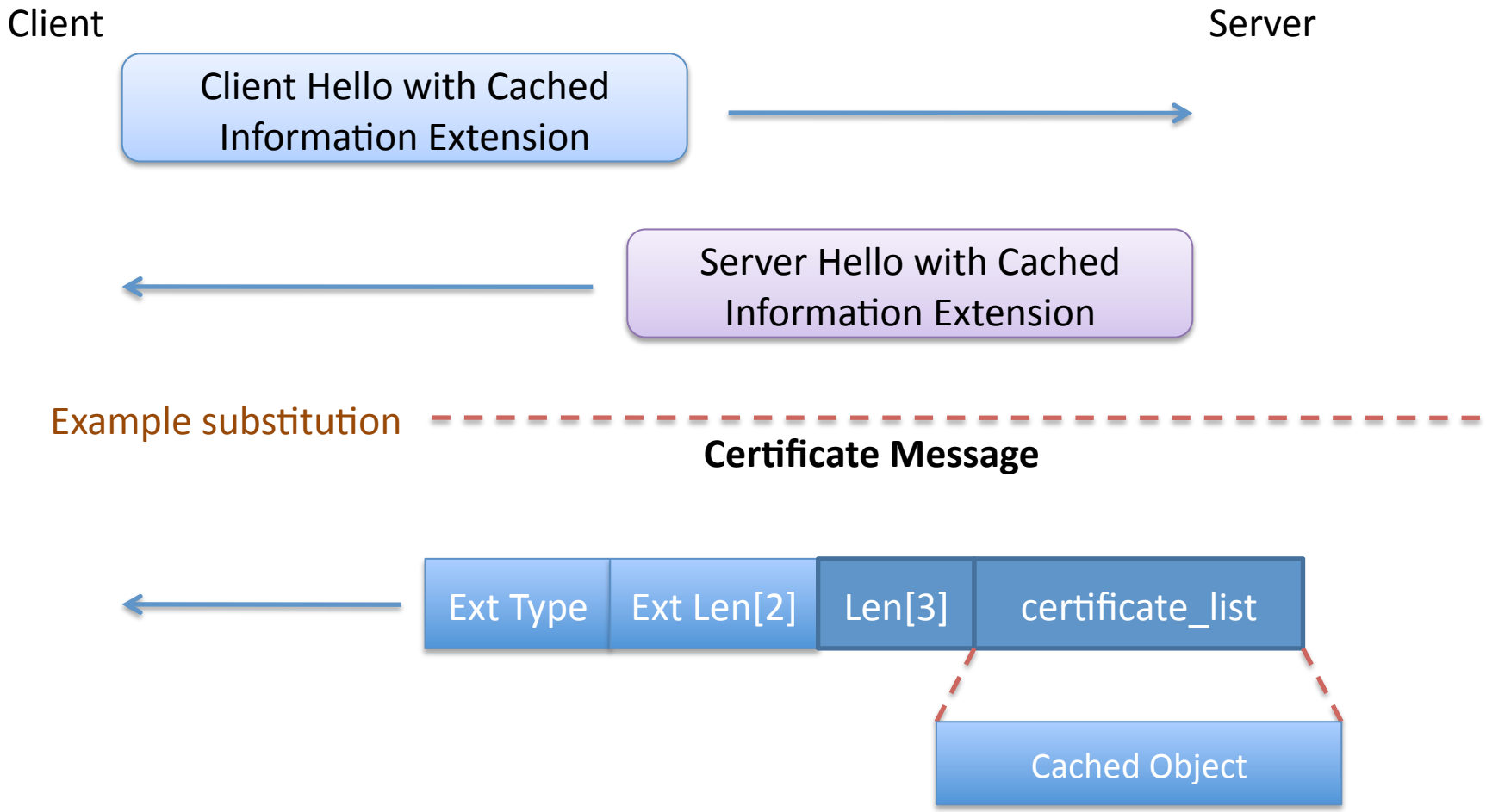
New

```
enum {
      certificate_chain(1), trusted_cas(2),
      (255)
} CachedInformationType;

struct {
      CachedInformationType type;
      HashAlgorithm hash;
      opaque hash_value<1..255>;
} CachedObject;

struct {
      CachedObject cached_info<1..2^16-1>;
} CachedInformation;
```

Message flow



Substitution Syntax – certificate_chain

Original handshake message syntax defined in RFC 5246 [RFC5246]:

```
opaque ASN.1Cert<1..2^24-1>;
```

Substitution syntax is defined by expanding the definition of the opaque ASN.1Cert structure:

```
CachedObject ASN.1Cert<1..2^24-1>;
```

Substitution Syntax – trusted_cas

Original handshake message syntax defined in RFC 5246 [RFC5246]:

```
opaque DistinguishedName<1..2^16-1>;
```

The substitution syntax is defined by expanding the definition of the opaque DistinguishedName structure:

```
CachedObject DistinguishedName<1..2^16-1>;
```

Using PRF

- Syntax
  - `PRF(secret, label, seed) =`
    `P_MD5(S1, label + seed) XOR P_SHA-1(S2, label + seed);`
- Proposal (by Marsh Ray)
  - `PRF("cached info", "cached info",`
    `MD5(cached_info_object) +`
    `SHA-1(cached_info_object)) [0..11])`

Possible approach

Current

```
struct {
     CachedInformationType type;
     HashAlgorithm hash;
     opaque hash_value<1..255>;
} CachedObject;
```

PRF

```
enum {
     prf(1), hash(2),
     (255)
} CacheHashMethod;

struct {
     CachedInformationType type;
     select (CacheHashMethod){
        case prf: cached_info_prf<1..255>;
        case hash: HashValue;
        }
} CachedObject;

Struct {
     HashAlgorithm hash;
     opaque hash_value<1..255>;
} HashValue;

cached_info_prf carry the value of:
  PRF("cached info", "cached info”,
  MD5(cached_info_object) +
  SHA-1(cached_info_object)) [0..11])
```

Remaining issues and way forward

- Define algorithm for generating cached info hash for < TLS 1.2
- If PRF, then how do we indentify PRF in the protocol?
- WGLC?

Questions / Comments