TLS – Cached Information

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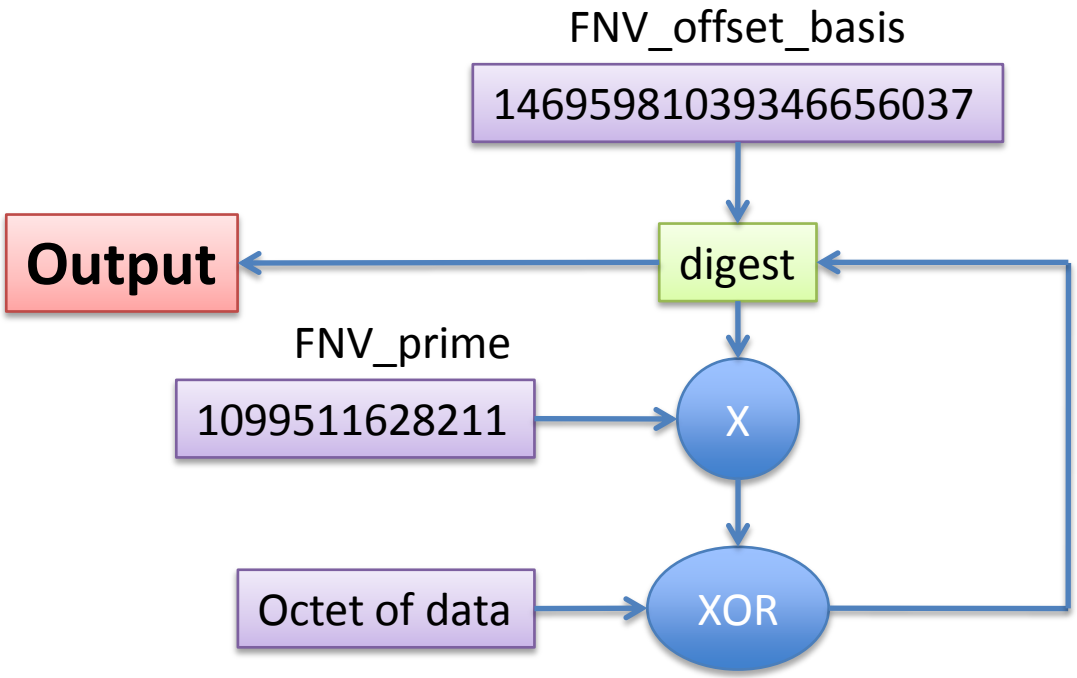
Status

- Substantial discussions since last IETF
  - Problems related to use of hash algorithms
    - Agility complexity
    - Need to specify a must implement hash for interoperability
    - No strong security requirements
  - Need for client to query server for cached info support
  - Need to explicitly define substitution syntax for each object type which preserve syntax of re-used handshake messages – alternatively define new handshake messages for substitution
- Result: Major rewrite in draft 04

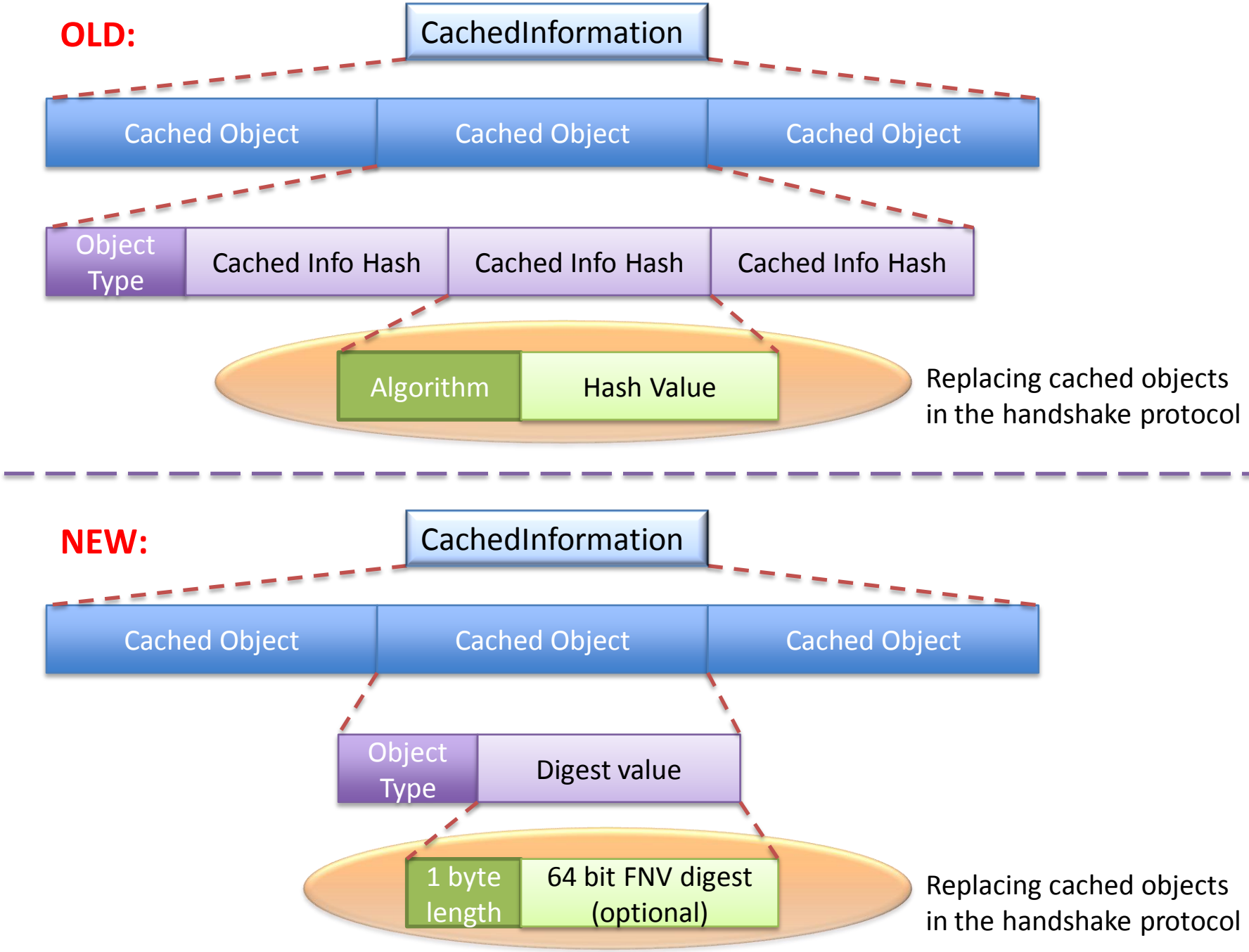
Major changes in draft 04

- All use of hash functions replaced with FNV-1 digest
  - FNV-1 specified in Annex 1
  - This specification uses the term “digest” instead of “hash” to avoid confusion and security concerns.
- Reconnaissance
  - Client may check server capability before caching
  - Server may provide supported digest values
- Defined substitution syntax for each object type
  - Preserving original handshake message syntax

FNV-1 digest




```
digest = FNV_offset_basis
  for each octet_of_data to be digested
    digest = digest * FNV_prime
    digest = digest XOR octet_of_data
  return digest
```


OLD:
CachedInformation
Cached Object
Cached Object
Cached Object
Object Type
Cached Info Hash
Cached Info Hash
Cached Info Hash
Algorithm
Hash Value
Replacing cached objects in the handshake protocol
NEW:
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

Extension syntax

Old

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

struct {
     HashAlgorithm hash;
     opaque hash_value<1..255>;
} CachedInformationHash;

struct {
     CachedInformationType type;
     CachedInformationHash hashes<1..2^16-1>;
} CachedObject;

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

New

```
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;
```

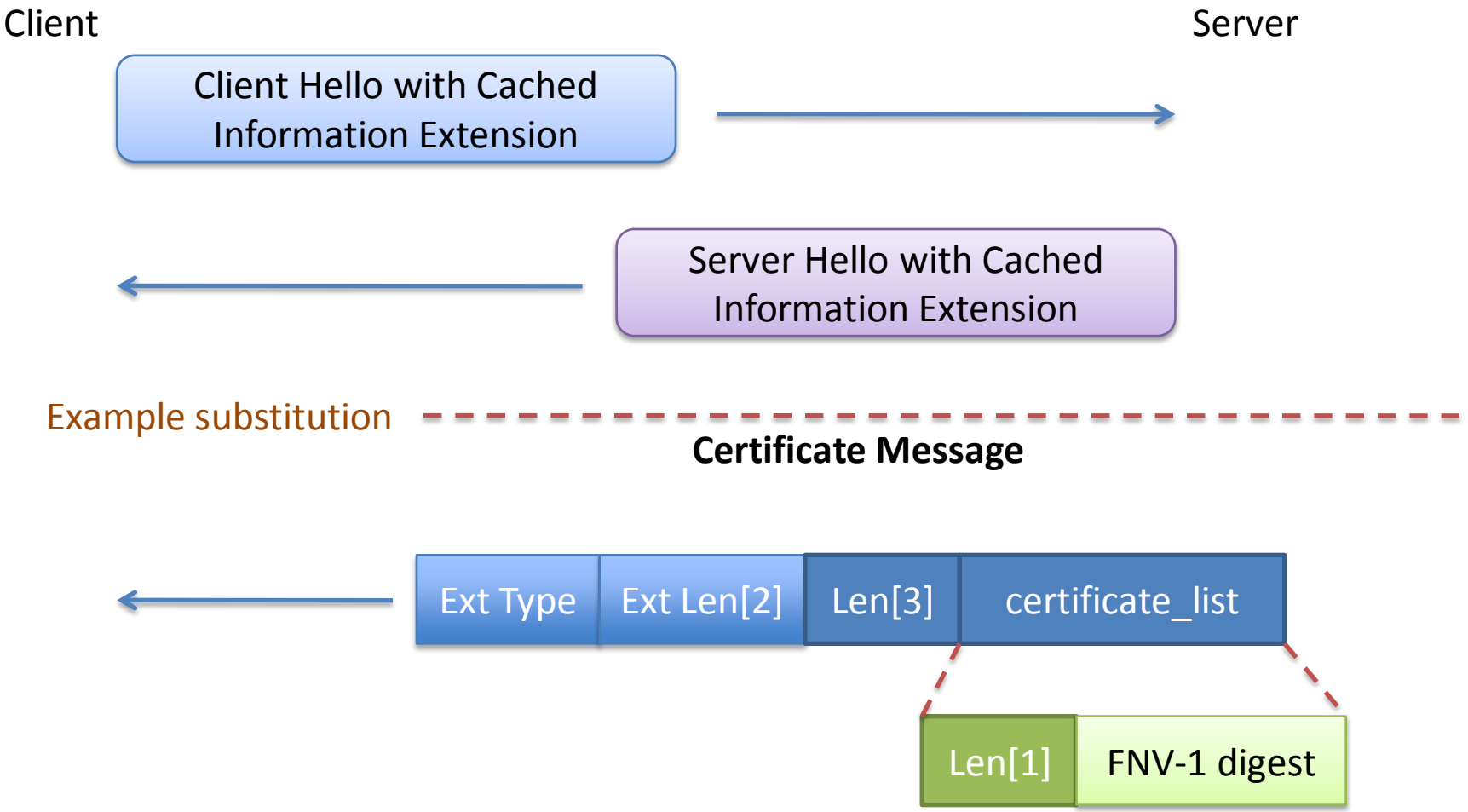
Client Extension

- Reconnaissance
  - Client MAY send empty cached info extension to query server capabilities
- Cached information
  - Client provide one digest value for each cached information object

Server Extension response

- Empty CI extension
  - Server supports information caching
- Cached objects with absent digest
  - Server supports caching of specified object types
- Cached objects with digest
  - Server supports caching of specified object types with specified digest values

Message flow



Substitution Syntax – certificate_chain

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

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

struct {
    ASN.1Cert certificate_list<0..2^24-1>;
} Certificate;
```

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

```
struct {
    opaque digest_value<0..8>;
} ASN.1Cert
```

Substitution Syntax – trusted_cas

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

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

struct {
    ClientCertificateType certificate_types<1..2^8-1>;
    SignatureAndHashAlgorithm
      supported_signature_algorithms<2^16-1>;
    DistinguishedName certificate_authorities<0..2^16-1>;
} CertificateRequest
```

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

```
struct {
    opaque digest_value<0..8>;
} DistinguishedName
```

Alternatives

1. Replace opaque digest_value<0..8>; with opaque digest_value[8];
   – Define a fixed 64 bit value to represent absent digest, e.g. [0,0,0,0,0,0,0,0]
2. Keep opaque digest_value<0..8>; but omit the one byte length in the substitution syntax

Way forward

- Evaluate the proposed updates
- Specify FNV in separate RFC?
- Obtain necessary permissions from FNV authors (copyright, not IPR)?
- If major changes are still required – Possible co-author
- WGLC

Questions / Comments