



# **Security Common Functions Architecture**

## **Candidate Version 1.1 – 30 Nov 2010**

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**Open Mobile Alliance**  
OMA-AD-SEC\_CF-V1\_1-20101130-C

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# 1. Scope

**(Informative)**

Common Security Functions Architecture provides common security architecture for OMA Enablers. SEC\_CF also describes a common way to implement security functionality for OMA Enablers and provides various architectures for different enabler deployment scenarios. Ultimately, it should be possible for all types of OMA enablers to use this architecture to provide security.

SEC\_CF will be accompanied with several Technical Specifications (TS). This specification (Architecture Document) intends to describe the high level architecture of the SEC\_CF and provide architecture guidance for different enabler deployment options. Details of the security implementations will be provided in separate technical specifications. The list of the technical specifications can be found in this document.

## 2. References

### 2.1 Normative References

- [GBA] 3GPP TS 33.220 "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Generic Authentication Architecture (GAA); Generic bootstrapping architecture", URL: <http://www.3gpp.org/ftp/Specs/html-info/33220.htm>
- [GBA2] 3GPP2 S.S0109-0 "Generic Bootstrapping Architecture (GBA) Framework", Version 1.0, 3rd Generation Partnership Project 2 (3GPP2), April 2006, URL: <http://www.3gpp2.org/>
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- [OMA-TS-GBA] "OMA GBA profile", Version 1.1, Open Mobile Alliance™, OMA-TS-GBA\_Profile-V1\_1, URL: <http://www.openmobilealliance.org/>
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- [OMA-TS-TLS] "OMA TLS Profile", Version 1.1, Open Mobile Alliance™, OMA-TS-TLS\_Profile-V1\_1, URL: <http://www.openmobilealliance.org/>
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URL: [http://openid.net/specs/openid-provider-authentication-policy-extension-1\\_0.html#OpenIDAuthentication2.0](http://openid.net/specs/openid-provider-authentication-policy-extension-1_0.html#OpenIDAuthentication2.0)
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- [RFC4279] IETF, RFC 4279, "Pre-Shared Key Ciphersuites for Transport Layer Security (TLS)", P. Eronen, H. Tschofenig, December 2005, URL: <http://www.ietf.org/rfc/rfc4279.txt>
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- [RFC4347] "Datagram Transport Layer Security", E. Rescorla, N. Modadugu, IETF RFC 4347, April 2006, URL: <http://www.ietf.org/rfc/rfc4347.txt>
- [SEC\_CF-RD] "Security Common Functions Requirements", Open Mobile Alliance™, OMA-RD-SEC\_CF-V1\_1, URL: <http://www.openmobilealliance.org/>
- [TCP] IETF, RFC 793, "Transmission Control Protocol", J. Postel, September 1981, URL: <http://www.ietf.org/rfc/rfc793.txt>

### 2.2 Informative References

- [ARCH-PRINC] "OMA Architecture Principles", URL: <http://www.openmobilealliance.org/>
- [ARCH-REVIEW] "OMA Architecture Review Process", URL: <http://www.openmobilealliance.org/>
- [OMADICT] "Dictionary for OMA Specifications", Version 2.8, Open Mobile Alliance™, OMA-ORG-Dictionary-V2\_8, URL: <http://www.openmobilealliance.org/>

## 3. Terminology and Conventions

### 3.1 Conventions

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as described in [**Error! Reference source not found.**].

All sections and appendixes, except “Scope” and “Introduction”, are normative, unless they are explicitly indicated to be informative.

### 3.2 Definitions

**Communication channel** A communication channel is the mean by which two entities can exchange messages.  
**SEC\_CF Domain** A set of entities for which a common party is responsible for the security functionality.

### 3.3 Abbreviations

<b>DTLS</b>	Datagram Transport Layer Security
<b>GBA</b>	Generic Bootstrapping Architecture
<b>MO</b>	Management Object
<b>OMA</b>	Open Mobile Alliance
<b>PSK-TLS</b>	Pre-Shared Key Ciphersuites for Transport Layer Security
<b>SA</b>	Security Association
<b>SEC_CF</b>	<b>Security Common Functions</b>
<b>SIP</b>	Session Initiation Protocol
<b>TCP</b>	<b>Transmission Control Protocol</b>
<b>TLS</b>	Transport Layer Security
<b>UDP</b>	User Datagram Protocol

## 4. Introduction

(Informative)

Security Common Functions Architecture aims to provide a common set of security mechanisms with their possible deployment options that can be re-used by OMA Enablers. The rationale behind this specification is to avoid, where possible, duplication of security effort for each OMA Enabler that requires security functionality. SEC\_CF offers to re-use both the architectural entities (e.g. Security Gateways, etc) and security specifications (e.g. protocol profiles) when developing new OMA enablers.

### 4.1 Version 1.0

SEC\_CF v1.0 aims to provide security functionality for OMA Enablers that are based on a Client-Server operational model and operate over TCP [TCP] as the transport protocol. A Client-Server operational model in the SEC\_CF context requires a Security Agent (e.g. implemented in the Mobile Terminal) requesting services from an application server. Security Agents are generally implemented on a mobile terminal and an application server is likely to be the part of an OMA Enabler such as location servers, charging elements, etc. that resides in a fixed network.

SEC\_CF defines functional entities such as security gateways and key management centres that can be integrated into the functional entities (e.g. mobile terminal, application server, etc) of the OMA Enabler architecture in order to provide security services. SEC\_CF also permits various deployment models to reflect the current established deployment models (Home domain only, visited domain, etc) of service providers. SEC\_CF defines several interfaces between its functional entities that can be implemented using industry standard security protocols. In some cases SEC\_CF functional entities might be integrated into the enablers own functional entities to avoid creating new interfaces and simplify the solution.

A successful use of the SEC\_CF by other OMA enablers requires an analysis of the security requirements to map the most appropriate SEC\_CF options. In most cases SEC\_CF cannot be used as a security add-on after the completion of the enabler specification. The development process of the enabler should consider SEC\_CF integration as early as possible to avoid any possible architectural inconsistencies.

In this context domain refers to SEC\_CF domain, as defined in section 3.2.

In a summary, SEC\_CF v1.0 supports the following functionalities.

- Support for OMA Enablers that are based on a Client-Server operational model
- Support for OMA Enablers over TCP protocol
- Support for SEC-CERT Management Object (MO)

### 4.2 Version 1.1

SEC\_CF v1.1 extends the existing SEC\_CFv1.0 to support a wider range of OMA enablers, including enablers operating over UDP as the transport protocol, and to support SIP.

SEC\_CF v1.1 supports the following additional functionalities.

- Support for OMA Push services
- Support for OMA Enablers over SIP protocol
- Support for OMA Enablers over UDP protocol
- Support for Delegated Authentication for Web Services

## 5. Architectural Model

SEC\_CF consists of architectural elements and interfaces between these elements. Detailed specifications of the architecture can be found in sections **Error! Reference source not found.** of this document. This section only provides a general overview. Figure 1 illustrates the architectural elements and related interfaces defined for SEC\_CF.

Current version of SEC\_CF defines the following architectural elements to operate:

- **Security Agent (SECA):** This element is the entity through which an application or a user interacts with a requesting resource. In the case of a user this may be done through a user interface (UI). A Security Agent may be implemented in a Mobile Terminal which may include a removable security token such as a (U)SIM/R-UIM. However, SEC\_CF also supports Security Agents that are implemented in application clients without a removable security token. Generally in the SEC\_CF the SECA acts on behalf of the user and all identifiers in the SECA are bound to the user (subscriber) identities. Device identifiers for Mobile Terminals are not used within the security context of this version of the SEC\_CF.
- **OMA Security Gateway (OSG):** This element provides security services such as authentication, encryption and integrity protection for any requesting resource that makes use of the SEC\_CF. OSG can be integrated into the resource utilising SEC\_CF or it can be deployed as a separate entity that can provide services to a number of resources that can be reached via an OSG.

The following interfaces are defined between the architectural elements in the SEC\_CF:

- **SEC-1:** This interface connects a SECA to an OSG. If a requesting resource selects an application specific protocol to be implemented, then that protocol can be secured using the security mechanisms implemented by **SEC-1**. Security services for this interface are implemented at the transport and application layers. Security functionality of this interface is defined in section 5.3.2.1 of this document.
- **SEC-2:** This interface securely connects an OSG to another OSG. This interface can be used for distributed enabler deployments where the SECA connects to a requesting resource in a visited domain via the home OSG. Security functionality of this interface is defined in section 5.3.2.2 of this document.
- **SEC-3:** This is an I0 interface that connects an OSG to a requesting resource in cases where the OSG is not fully integrated into the requesting resource. Its definition is out of the scope of the work item as each requesting resource can implement SEC-3 based on the enabler specific protocols. The specific protocol realizations for this interface are out of scope.

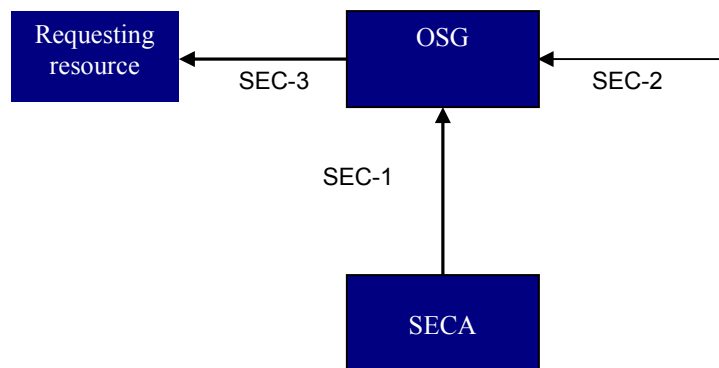
### 5.1 Dependencies

SEC\_CF architecture relies on several IETF specifications. The lists of dependencies are as follows:

- IETF TLS (Transport Layer Security) [RFC4346]
- IETF PSK-TLS (Pre-Shared Key Ciphersuites for Transport Layer Security) [RFC4279]
- IETF HTTP Digest Authentication [RFC2617]
- IETF IPsec (Internet Security Architecture) [RFC4301]
- IETF DTLS (Datagram Transport Layer Security) [RFC4347]

### 5.2 Architectural Diagram





**Figure 1: Overview of the SEC\_CF Architecture**

The SEC\_CF architecture diagram is depicted in above Figure 1. The architectural components and interfaces will be detailed in clause 5.3.

## 5.3 Functional Components and Interfaces/reference points definition

Details of the architectural elements and interfaces of SEC\_CF can be found in this section.

### 5.3.1 Functional Elements

#### 5.3.1.1 Security Agent (SECA)

Security Agents is an entity that implements the SEC\_CF security functionality. It interfaces with the OSG.

Security Agent provides the following functionality:

- Interfaces with the removable security tokens such as (U)SIM in 3GPP deployments. It MAY interface with R-UIM in 3GPP2 deployments.
- Provides unique identities.
- Uses the necessary key material to perform security services.
- Handles security credentials such as key materials to be used for SEC\_CF operations.
- Performs the following security services: Authentication, Confidentiality and Integrity Protection. And MAY provide Denial of Service (DoS) protection.
- It can communicate either with Home or visited OSG.

#### 5.3.1.2 OMA Security Gateway (OSG)

OMA Security Gateway provides the following functionality:

- Provides all the security services defined in the SEC\_CF (Authentication, Authorization, Confidentiality and Integrity Protection, Replay Protection) to resources that are connected to it. It MAY provide DoS protection.

### 5.3.1.3 Requesting resource

Requesting resource is an OMA Enabler that requests security services defined in SEC\_CF (e.g., authentication of a user) from OSG. Requesting resource is not defined in SEC\_CF.

## 5.3.2 Interfaces

### 5.3.2.1 SEC-1

This interface MUST at least support TLS for transport layer security to provide authentication of the OSG to the SECA. If HTTP is used, HTTP Digest MUST also be used to provide authentication of the SECA to the OSG. If HTTP is not used as transport protocol for this interface, then PSK-TLS and/or client certificates MUST be supported in order to provide mutual authentication between the OSG and SECA in the transport layer.

If OMA Enablers operate over UDP protocols, this interface SHOULD support DTLS or IPSec to provide authentication, confidentiality and integrity protection between OSG and SECA.

If OMA Enablers support web services, this interface SHOULD support delegated authentication of the SECA to the OSG. If a mechanism for the delegated authentication is based on OpenID, the interface MUST support [OpenIDAuthentication2.0]

If OMA Enablers are providing Location information over SIP protocol, this interface SHOULD support GBA over SIP as defined in [LOCSIP 1.0] to provide authentication, confidentiality and integrity protection between OSG and SECA.

If OMA Enablers support push services, this interface SHOULD support GBA Push to provide authentication, confidentiality and integrity protection of the OSG to the SECA.

### 5.3.2.2 SEC-2

This interface MUST at least support TLS [RFC 4346] and SHOULD also support IPSec [RFC4301] in tunnel mode with confidentiality [RFC 2406] and integrity protection [RFC2406].

### 5.3.2.3 SEC-3

This interface is not defined by SEC\_CF.

Note: OSG initiated secure triggers use cases are FFS.

### 5.3.2.4 Basic flow

The basic SECA initiated flow is indicated in Figure 2. The first step is that that SECA initiates a setup of a TLS tunnel between itself and the OSG. For mutual authentication we have three cases: 1) A shared key is used together with PSK-TLS. 2) The server is authenticated via a server certificate and the SECA via HTTP Digest and 3) The server and the client both use certificates for authentication.

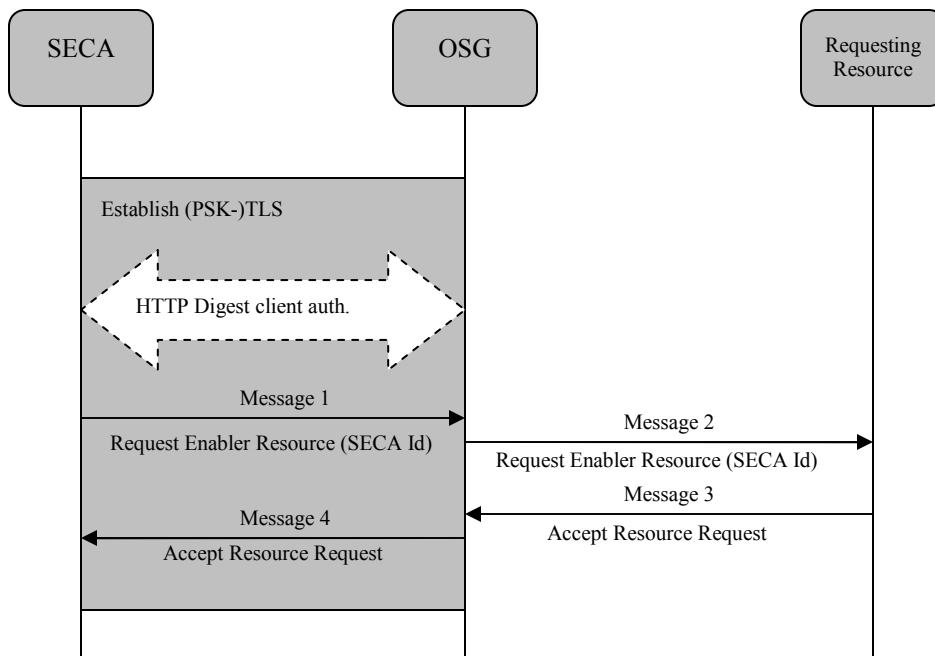


Figure 2: Basic call flow

## 5.4 Security Considerations

This enabler defines several security features such as authentication, confidentiality protection and integrity protection to be re-used by other OMA enablers. Security considerations for each security function are detailed in the relevant SEC\_CF technical specifications.

## 6. SEC\_CF Deployment Options (Informative)

SEC\_CfV1.1 allows SECAs to securely access resources in the visited domains either via the Home OSGs or directly via the visited OSG. The particular deployment of SEC\_CF may depend on the specific operational requirements of the OMA Enabler as well as the underlying the IP transport model.

SEC\_CfV1.1 provides security functionalities for push services and delegated authentication for web services.

### 6.1 Deployment

For the following deployment scenarios some additional elements and interfaces are introduced (in addition to the architectural elements and interfaces defined in chapter 5):

#### Key Management Centre (KMC)

Key Management Centre provides the following functionality:

- Provides the key management support to the OSG (Home and Visited).
- Provides key management to the SECA

KMC can also be integrated into the OSG.

Note: in the case where KMC is not integrated into the OSG, the KMC could be based on the BSF as defined in [GBA][GBA2].

#### KMC-IF

This interface connects an OSG to a KMC. The interface is not defined by SEC\_CF.

Note: For 3GPP based implementations this interface corresponds to the Zn interface defined in Generic Bootstrapping Architecture [GBA] defined in 3GPP specifications.

#### 6.1.1 SEC\_CF Direct OSG Access

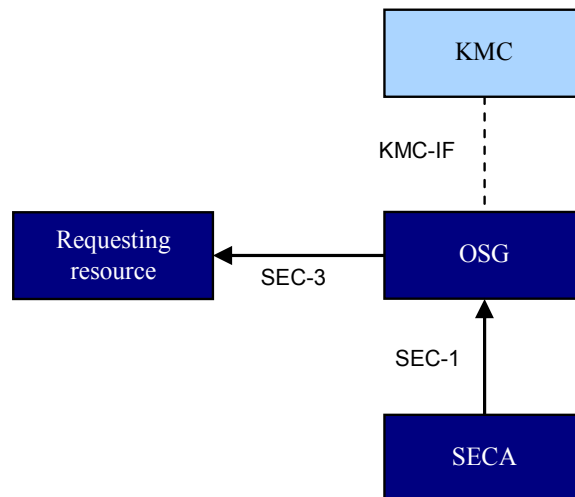


Figure 3: SEC\_CF Home Domain Deployment

In the cases where GBA is used for key management SECA will also have additional interfaces to the KMC (BSF in GBA). This interface is defined in 3GPP specifications and it is outside the scope of SEC\_CF.

When the SEC-1 interface is GBA-based, a Ua security protocol identifier is needed. For more information see the corresponding section in [OMA-TS-GBA].

### 6.1.2 SEC\_CF Proxy OSG Access

For SEC\_CF deployment based on GBA, only “Proxy Mode” is feasible. The home OSG will act as a proxy for the OMA enabler in the visited domain. Home OSG MUST provide a secure connection over the SEC-2 between the home and the visited OSG.

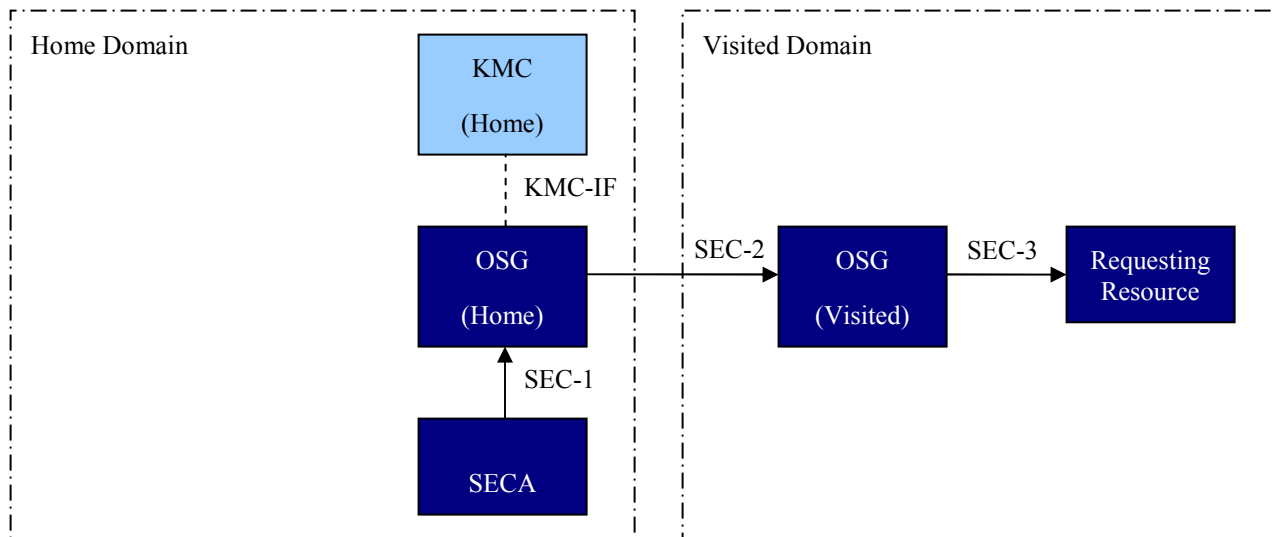
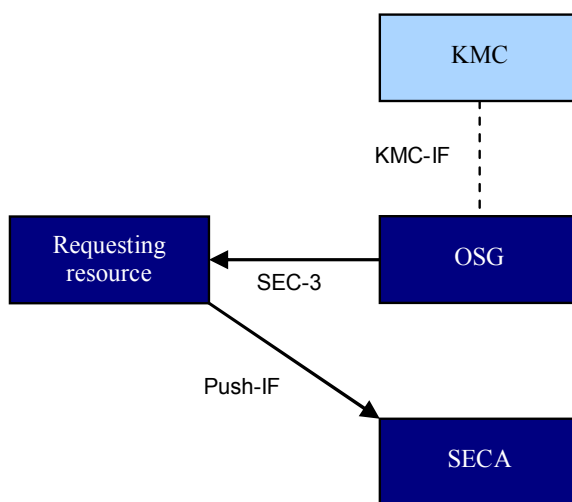


Figure 4: GBA deployment for SEC\_CF roaming domain architecture

### 6.1.3 SEC\_CF support for Push Services



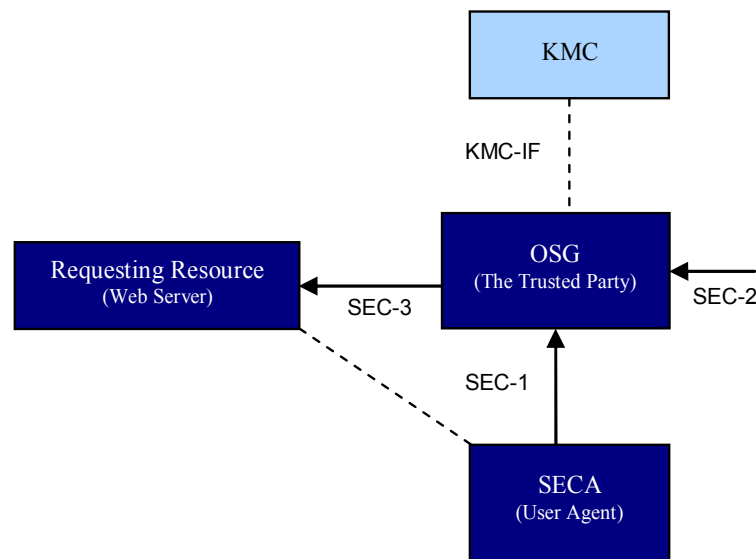
**Figure 5: SEC\_CF support for push services**

The interface Push-IF pushes security materials from the OSG to the SECA.

For 3GPP based implementations, the interface Push-IF corresponds to the interface Upa and OSG corresponds to NAF (Network Application Function) which are defined in Generic Bootstrapping Architecture Push Function [GBA-Push]

### 6.1.4 SEC\_CF support for Delegated Authentication for Web Services

To support delegated authentication for web services, OSG together with KMC will act as a trusted party to authenticate SECA implemented in User Agent for Requesting Resource residing in the web server. The possible deployment of SEC\_CF is described in the following Figure 6.

**Figure 6: SEC\_CF support for delegated authentication for web services**

For above Figure 6, it is possible that KMC reuse the key management of underlying network (e.g., IMS AKA, UMTS AKA, and EPS AKA.). In this way, operators serving as the trusted party can deploy SEC\_CF by reusing their existing infrastructures (e.g., UICC applications and HSS) and also can introduce strong authentication to web services.

## 6.2 Enabler Protocol Requirements

Following requirements are defined for any OMA Enabler deployments that implement this version of the SEC\_CF to secure its operations.

- The Enabler protocol MUST be based on one of the following protocols: TCP, UDP, SIP and HTTP
- The Enabler protocol MUST operate in a Client-Server model.

## 6.3 Flows

### 6.3.1 Establishing a secure communication channel using SEC\_CF

#### 6.3.1.1 SECA initiated SEC\_CF usage

The basic SECA initiated flow is indicated in Figure 7. The first step is that that SECA initiates a setup of a TLS tunnel between itself and the OSG. For mutual authentication we have three cases: 1) A shared key is used together with PSK-TLS. 2) The server is authenticated via a server certificate and the SECA via HTTP Digest and 3) The server and the client both use certificates for authentication. In cases 1) and 2) The OSG requests the credentials to be used from the KMC in Message 1 and receives them in Message 2. In cases 3) The OSG requests the credentials to be used from the KMC in Message 4 and receives them in Message 5.

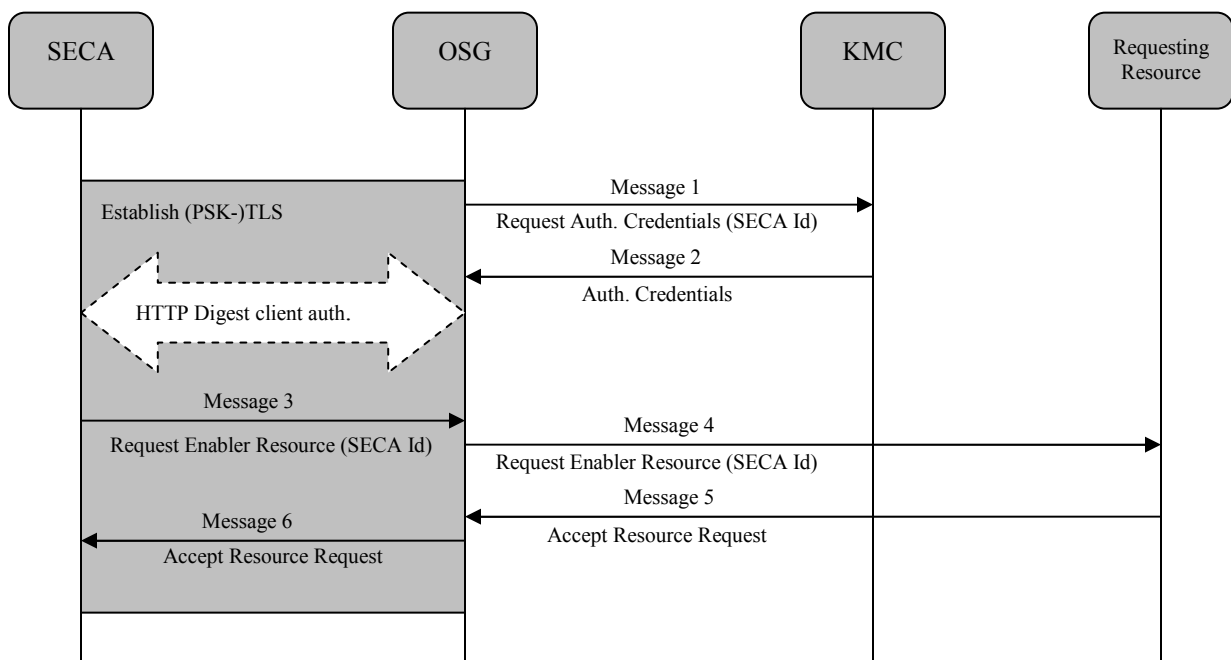


Figure 7: SECA initiated call flow

## 6.4 Related Specifications

Further Details of SEC\_CF are defined in the following specifications.

- SEC\_CF TS the Profile of TLS and DTLS [OMA-TS-TLS\_Profile-V1.1]
- SEC\_CF TS the Profile of GBA and GBA Push [OMA-TS-GBA\_Profile-V1.1] [OMA-SUP-XSD\_seccf\_gba-V1\_1]
- SEC\_CF DDS OMA SEC-CERTManagement Objects (MO) [OMA-DDS-SEC\_CERT\_MO-V1.0][OMA-SUP-MO\_SEC\_CERT-V1.0]
- SEC\_CF TS IPSec Profile [OMA-TS-IPSec\_Profile-V1.1]
- SEC\_CF Delegated\_Authn\_Profile [OMA-TS-Delegated\_Authentication\_Profile-V1\_1]

## Appendix A. Change History

(Informative)

### A.1 Approved Version History

Reference	Date	Description
Approved Versions: OMA-AD-SEC_CF-V1_0-20080902-A	02 Sep 2008	Status changed to Approved by TP OMA-TP-2008-0321-INP_SEC_CF_V1_0_ERP_for_Final_Approval

### A.2 Draft/Candidate Version 1.1 History

Document Identifier	Date	Sections	Description
Draft Versions OMA-AD-SEC_CF-V1_1	21 Jul 2009	All	Initial baseline version
	09 Oct 2009	1. , 2. , 2.1, 2.2, 3.1, 3.2, 3.3, 4., 4.1, 4.2,	OMA-ARC-SEC-2009-0065 OMA-ARC-SEC-2009-0066 OMA-ARC-SEC-2009-0067 OMA-ARC-SEC-2009-0068R01
	20 Oct 2009	5, 5.1, 5.2, 5.3.1.3, 5.3.2.3, 5.3.2.4, 5.4 6.1, 6.1.3, 6.2, 6.3.1.1, 6.4	OMA-ARC-SEC-2009-0078R01-CR_SEC_CF1.1_AD_sections_5_and_6
	26 Dec 2009	5.2, 5.3.1.3, 6.1.4 6.3.1.1	OMA-ARC-SEC-2009-0084
	15 Jan 2010	2.1, 2.2,, 3.2, 3.3, 4.2, 5, 5.1 5.3.1.2, 5.3.1.3, 5.3.2.1 5.3.2.4, 6, 6.1 6.1.1, 6.1.3, 6.1.4, 6.3.1.1 6.4, A.2	OMA-ARC-SEC-2009-0092R03-CR_Bug_Fix_for_SEC_CF1.1_AD
	02 Feb 2010	All	Online edit according to OMA-ADRR-SEC_CF-V1_1-20100131-D
	02 Mar 2010	5.3.1.2, 6.1.3	OMA-ARC-SEC-2010-0016R01-CR_SEC_CfV1.1_ADRR_A008
	Candidate Version OMA-AD-SEC_CF-V1_1	30 Mar 2010	All
Draft Versions OMA-AD-SEC_CF-V1_1	29 Oct 2010	5.3.1.2, 5.3.2.1, 6.4	Incorporating the CR OMA-ARC-SEC-2010-0105-CR_CONR_SEC_CF1.1_AD_B001_B002_B003
	03 Nov 2010	5.3.1.2	Removed duplicate title number as per comments received during AD Socialization
Candidate Version OMA-AD-SEC_CF-V1_1	30 Nov 2010	All	Status changed by TP: OMA-TP-2010-0472-INP_SEC_CF_V1_1_ERP_for_Candidate_Approval Editorial fixes: history table