Mobile Search Framework

Approved Version 1.0 – 31 Jul 2012

Open Mobile Alliance
OMA-TS-MSrchFramework-V1_0-20120731-A

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1. Scope

This Technical Specification (TS) document defines the components and interfaces of the Mobile Search Framework Enabler. This includes the functionalities of the components and the parameters of the interfaces.

2. References

2.1 Normative References

[RFC2119]	"Key words for use in RFCs to Indicate Requirement Levels", S. Bradner, March 1997, URL:http://www.ietf.org/rfc/rfc2119.txt
[RFC4234]	"Augmented BNF for Syntax Specifications: ABNF". D. Crocker, Ed., P. Overell. October 2005, URL:http://www.ietf.org/rfc/rfc4234.txt
[SCRRULES]	"SCR Rules and Procedures", Open Mobile Alliance™, OMA-ORG-SCR_Rules_and_Procedures, URL:http://www.openmobilealliance.org/
[ISO 3166]	"Codes for the representation of names of countries and their subdivisions", ISO, URL:www.iso.org
[RFC2616]	"Hypertext Transfer Protocol – HTTP/1.1, R.Fielding et al, June 1999, URL:http://www.ietf.org/rfc/rfc2616.txt
[PUSH-OTA]	"Push Over The Air", Open Mobile Alliance™, OMA-TS-PushOTA-V2_3, URL:http://www.openmobilealliance.org/
[PUSH-PAP]	"Push Access Protocol", Open Mobile Alliance™, OMA-TS-PAP-V2_3, URL:http://www.openmobilealliance.org/
[PUSH-MSG]	"Push Message", Open Mobile Alliance™, OMA-TS-Push_Message-V2_3, URL:http://www.openmobilealliance.org/
[PUSH-SL]	"ServiceLoading", WAP Forum™, WAP-168-ServiceLoad-20010731-a, URL:http://www.openmobilealliance.org/
[MSF-RD]	"MSrchFramework Requirement Document" , Open Mobile Alliance™, OMA-RD- MSrchFramework-V1_0, URL:http://www.openmobilealliance.org/
[MSF-AD]	"MSrchFramework Architecture Document", Open Mobile Alliance™, OMA-RD- MSrchFramework-V1_0, URL:http://www.openmobilealliance.org/
[BCP 47]	"Tags for Identifying Languages", IETF Best Current Practice, URL: http://www.ietf.org/rfc/bcp/bcp47.txt
[PARA-EXT]	OpenSearch Extension Parameter URL: http://www.opensearch.org/Specifications/OpenSearch/Extensions/Parameter/1.0
[RFC4287]	"The Atom Syndication Format", M. Nottingham et al, December 2005 URL: http://www.ietf.org/rfc/rfc4287.txt
[OMA-MobAd-TS]	"OMA Mobile Advertising Core Technical Specification", Open Mobile Alliance™, OMA-TS-MobAd_Core-V1_0, URL:http://www.openmobilealliance.org/
[OPENSEARCH]	OpenSearch 1.1, Draft 4 Specification, URL: http://www.opensearch.org/Specifications/OpenSearch/1.1
[GEORSS]	GeoRSS Specification, URL: http://www.georss.org
[MSFCC MO-TS]	"OMA MSF-Client Configuration Management Object Technical Specifications", Open Mobile Alliance™, OMA-TS-MSrchFramework_MO-V1_0, URL:http://www.openmobilealliance.org/
[OpenSearch-Geo]	OpenSearch Geo Extension URL: http://www.opensearch.org/Specifications/OpenSearch/Extensions/Geo/1.0/Draft_2
[XML Schema Part 2: Datatypes]	XML Schema Part 2: Datatypes Second Edition, URL: http://www.w3.org/TR/xmlschema-2/

2.2 Informative References

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 [RFC2119].

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

3.1.1 Additional Conventions

Explanation of the XML Type in Mobile Search Framework tables is as follows:

- E = Elements
- A = Attributes
- Attributes apply to the parent Element.

Each message start with a message element, noted as E.

Explanation of the Parameter cardinality in MsrchFramework Tables is as follow:

- 1 means the parameter has one instance
- 0..1 means the parameter is either missing or has exactly one occurrence
- 0..N means the parameter has zero or more occurrences.
- 1..N means the parameter has one or more occurrences.

3.2 Definitions

Answer History	See definition in [OMA-MSrchFramework-AD]
Domain Relevance	Show how well a Search Sub-Domain is relevant to a document.
Expert	See definition in [OMA-MSrchFramework-RD]
Expert Rank	The reputation of expert calculated/maintained by MSAS based on user's Feedback and Interaction on the answers provided by the Expert.
Feedback	See definition in [OMA-MSrchFramework-RD]
Importance Level	Importance Level is the rank maintained by MSF for SE and other MSS. Several factors are considers for this. Some of them identified by this enabler are response time, cost and quality of content.
Interaction	See definition in [OMA-MSrchFramework-RD]
Local Rank	Rank for the result calculated by SEs according to their own policies.
Meta-Index	See definition in [OMA-MSrchFramework-AD]
Personalization Score	See definition in [OMA-MSrchFramework-AD]
QA Field	See definition in [OMA-MSrchFramework-RD]
Search Context Session	Search Context Session is identified as a time interval right before the current search request, including the time when the current search request is submitted. E.g. it can be last 15 minutes including the time when the search request is submitted. The exact definition of time interval is implementation specific. The sequence of search requests made during Search Context Session can be analyzed to understand user's instant interest, as compare to overall interest, in particular Search Domain or Search Sub-Domain
Search History	See definition in [OMA-MSrchFramework-AD]

Search Sub-Domain	A Search Sub-Domain is considered to be a search category related to a Search Domain. All the incoming search requests can be categorized according to a Search Domain and then further according to a Search Sub-Domain. The e.g. for Search Sub-Domain are New, Old, TopFloor for Real-Estate Search Domain.
Term Frequency	Numbers of times a term is appearing in a document.
Trust Relationship	A Trust Relationship is an explicit declaration of the level of trust on a particular topic among users (e.g. Alice trusts Bob on the "food" liking or on the "fashion" liking). Trust Relationships are used as basis for the creation of a user's trust network, which can be used to provide recommendations.
URL Template	A parameterized (name- value pair) form of a URL, as specified by [OpenSearch] by which a SE is queried. Example of URL template is as follows. **http://www.example.com/search?q={Query-Text}&rn={Result-num}** The strings in { } are the Parameter Name. The defined Parameter Name by OpenSearch are further extended by this specification.
User Interest Model	The user's interest is divided into n dimensions such as finance, sports, science etc. User Interest Model (User-im) is a vector of those dimensions indicating the score of user's interest in different Search Domain. The interest in a particular Search Domain/Search Sub-domain can be general i.e. calculated based on e.g. Search History, user profile, Feedback/interaction. Alternatively, it can be session-based i.e. related to the Search Context Session, where the calculation of the interest takes into account the sequence of queries (including current search request) in a specified time frame. Any data mining technology is left for the implementation.

3.3   Abbreviations

MSAS	Mobile Search Application Server
MSF	Mobile Search Framework
MSS	Mobile Search Server
OMA	Open Mobile Alliance
Q&A	Question and Answer
SE	Search Engine
UIM	User Interest Model

4. Introduction

This document defines the technical framework and specifies mechanisms to enable services based on the MSF requirement document [OMA-MSrchFramework-RD] and the MSF architecture document [OMA-MSrchFramework-AD].

This document is further organized as follows:

- Section 5 defines the operations performed on different MSF interfaces. Several messages are defined with the number of parameter for the operation defined.

- Section 6 defines that behaviour of different entities on receiving/sending particular response/request.

- Section 7 provides the protocol bindings for all the messages defined.

- Section 8 defines that data model consisting of Data types, commonly used parameters and structures, XML schema etc.

- Appendix C provides a couple of methods, following the specification, for SE selection.

- Appendix D provides User Interest Model.

- Appendix E provides message examples.

4.1 Version 1.0

Version 1.0 of the MSF Enabler addresses all of the functional requirements included in [OMA-MSrchFramework-RD] for MSF 1.0.

5. Interface Descriptions

5.1 Description of frequently used parameters

The following table contains descriptions of frequently used parameters used throughout the document:

Parameter name	Data type	Description
Client-ID	String	Unique identifier of the MSF-Client Note: the assignment and generation of Client-ID are out of scope.
MSAS-ID	String	Unique identifier of the MSAS Note: the assignment and generation of MSAS-ID are out of scope.
MSS-ID	String	Unique identifier of the MSS Note: the assignment and generation of MSS-ID are out of scope.
SE-ID	String	Unique identifier of the SE Note: the assignment and generation of SE-ID are out of scope.
Expert-ID	String	Unique identifier of the Expert Note: the assignment and generation of Expert-ID are out of scope.
Question-ID	String	A unique identifier for a question provided by user. Note: the assignment and generation of Question-ID are out of scope.

Table 1: Frequently used parameters

5.2 MSF-1

5.2.1 Query Capabilities

This operation allows sending a query from the MSF-Client to ask the capabilities supported by the MSAS. Some of the returned parameters in the response from the MSAS are used by the MSF-Client in following requests.
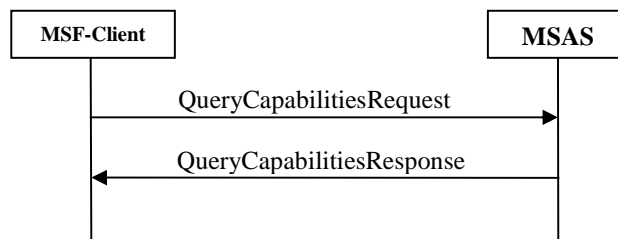
Figure 1: QueryCapabilities messages exchange

Message	Requirement	Direction
QueryCapabilitiesRequest	Mandatory	MSF-Client → MSAS
QueryCapabilitiesResponse	Mandatory	MSF-Client ← MSAS

5.2.1.1   QueryCapabilitiesRequest

Name	Cardinality	Data Type	Description
Client-ID	0…1	String	The request originator who want to know the MSAS capabilities.
CapabilityName	0…N	Enumeration	Capability name requested by the MSF-Client. See section **Error! Reference source not found.** for the list of capability names. If not specified, it is returned the complete list of capabilities.

Table 2: QueryCapabilitiesRequest message

5.2.1.2   QueryCapabilitiesResponse

Name	XML Type	Cardinality	Data Type	Description
CapabilitiesList	E	1	Structure	Capabilities supported by the MSAS
Status-Code	A	0…1	String	Error codes

Table 3: QueryCapabilitiesResponse message

5.2.2   Search

The Search operation from MSF Client to MSAS is performed over the MSF-1 interface. This function consists of two messages: SearchRequest and SearchResponse for request and response respectively.
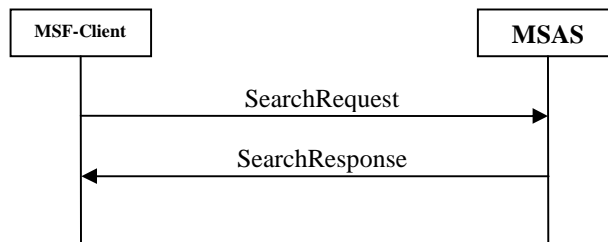
Figure 2: Flow for Search Request and its response

Message	Requirement	Direction
SearchRequest	Mandatory	MSF-Client → MSAS
SearchResponse	Mandatory	MSF-Client ← MSAS

5.2.2.1   SearchRequest

In the SearchRequest message MUST be present at least one of the following optional parameters as search input:

- searchTerms

- Tags

- Content

- Content-URL

Information Element	Cardinality	Type	Description
searchTerms	0…1	String	Search Keywords
Tags	0…1	String	Comma-separated list of tags related to the search
Content	0…1	Base64	Binary content submitted as search input
Content-URL	0…1	String	URL of the file submitted as search input
Domain-Name	0…1	String	This element specifies the search domain of the search request.
Client-ID	1	String	See the description in section 5.1

Receiver-ID	0…1	String	The parameter specifying the ID for the MSF-Client which should be receiving the results. If the Receiver-ID is not same with the MSF-Client ID sending the request, the negotiation with the receiver is prerequisite for sending result to it.
RecommendationAl	0…N	String	Recommendation algorithm to be applied while computing Recommendation. See section **Error! Reference source not found.** for a list of reserved values for recommendation algorithms.
Lat	0…1	float	Target location in terms of Latitude, alternative to the current user location
Lon	0…1	float	Target location in terms of Longitude, alternative to the current user location
Region	0…N	string	A string representation of a sub-division inside a country as specified in [ISO 3166]. This indicates the target region to be considered, alternative to the current user location.
resultsType	0…N	String	Indicates the type of content that the user want for his search or subscription (e.g. video, picture, text, …)
ratingThreshold	0…1	Integer	Indicate the threshold of rating that the results must pass.
contentFilter	0…1	String	Indicates the level of search results filtering desired based upon sensitivity of search user to the potential results. Possible values are: "none", "moderate" and "strict". The MSF provider is responsible for the association of these filtering levels to specific criteria, e.g. as those criteria may vary by region.
Language	0…1	String	Indicate the language of the results. Refer to BCP 47 "Tags for Identifying Languages" [BCP 47] for the available language vocabulary.
Site	0…N	String	Restricts the search to a specific internet domain.
Count	0…1	Integer	Total number of results requested per page.

Table 4: Information elements in SearchRequest message

In addition, the SearchRequest MAY contain additional parameters specific for a given SearchDomain extended by the implementation (e.g. for "Restaurant" a specific criteria is the type of food such as: Chinese, vegetarian, Italian, …; or the price range, …).

5.2.2.2 SearchResponse

The SearchResponse message SHALL be formatted as Atom feed according to [RFC4287].

The following table shows the Atom representation of the elements of the Search Response feed. In addition, this specification uses some of the OpenSearch 1.1 Response elements in Search Response feeds.

Unless indicated otherwise, the XML elements in the "Atom Representation" column are in the Atom namespace and defined in [RFC4287]. In particular, items containing the "openSearch:" prefix are defined in [OPENSEARCH].

Other Atom elements or any extension not indicated in this table MAY be included in the Search Response to provide further information.

Note: This summary uses standard XPath notation: in particular, slashes show the element hierarchy, and an @ sign indicates an attribute of an element.

Feed Schema Item	Cardinality	Atom Representation	Description
Total-result-no	0…1	`/feed/openSearch:totalResults`	Total result number found.
Result-num	0…1	`/feed/openSear`	Total result returned in this response (page).

		ch:itemsPerPage	
Request-ID	1 (as per [RFC4287])	/feed/id	Identify the request to which belongs this response and related results.
Current-start-index	0…1	/feed/openSearch:startIndex	The index of the first result provided to the MSF-Client in this response.
Search Response Author	1…N (as per [RFC4287])	/feed/author	The author/source(s) of the Search Response, such as the identifier or name of MSS/SE (Provider ID). See [RFC4287] for more details about requirements on this item.
Response Last Update Date	1 (as per [RFC4287])	/feed/updated	Identifies the date of the Search Response last update (or generation)
Response Title	1 (as per [RFC4287])	/feed/title	A title representation of the search response

Table 5: Search Response message Atom representation

Each Search Response feed SHALL contain a list of results with several other result specific information, formatted in Atom entries. The elements of a Search Response result entry are detailed in section 8.2.1.

5.2.3   Subscribe

The Subscribe from MSF Client to MSAS is performed over the MSF-1 interface. This function consists of two messages SubscribeRequest and SubscribeConfirmation for request and response respectively.
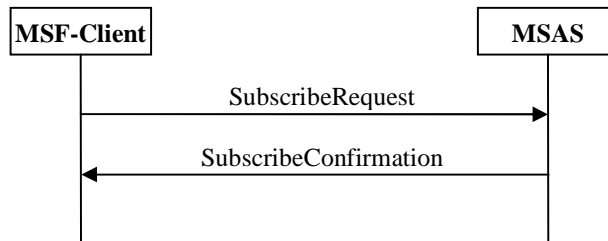
Figure 3: Flow for Subscribe Request and its response

Message	Requirement	Direction
SubscribeRequest	Mandatory	MSF-Client → MSAS
SubscribeConfirmation	Mandatory	MSF-Client ← MSAS

5.2.3.1   SubscribeRequest

In the SubscribeRequest message MUST be present at least one of the following optional parameters as search input:

- searchTerms

- Tags

- Content

- Content-URL

Information Element	Cardinality	Type	Description
searchTerms	0…1	String	Search Keywords
Tags	0…1	String	Comma-separated list of tags related to the search
Content	0…1	Base64	Binary content submitted as search input

Content-URL	0…1	String	URL of the file submitted as search input
Domain-Name	0…1	String	This element specifies the search domain of the search request.
Trigger-Criteria	1	Structure	Structure specifying Triggering Criteria for pushing the results.
Receiver-ID	0…1	String	This element specifies who will receive the following pushed content of the subscription. If this element is missing, content will be pushed to the subscription requestor. If this is present, the negotiation with the recipient to get pushed content is a prerequisite.
Duration	1	Duration	Specifying the life of this subscription.
LocationUseOpt	0…1	Boolean	A Boolean parameter specifying user's willingness to allow use of his/her location to get personalized results using context information, to complement search inputs, while generating search request. If TRUE then only, MSS shall consider contextlocation information (location, profile, etc) while generating search request. E.g. if user location is "Boston" and keywords provided are "Nike stores" then MSAS may generate final request with keywords "Nike stores Boston". The default value is FALSE.
Client-ID	1	String	See the description in section 5.1
RecommendationAl	0…N	String	List of recommendation algorithm(s) (one or more) to be applied while computing Recommendation.
Lat	0…1	float	Target location in terms of Latitude, alternative to the current user location
Lon	0…1	float	Target location in terms of Longitude, alternative to the current user location
Region	0…N	string	A string representation of a sub-division inside a country as specified in [ISO 3166]. This indicates the target region to be considered, alternative to the current user location.
resultsType	0…N	String	Indicates the type of content that the user want for his search or subscription (e.g. video, picture, text, …)
ratingThreshold	0…1	Integer	Indicate the threshold of rating that the results must pass.
contentFilter	0…1	String	Indicates the level of search results filtering desired based upon sensitivity of search user to the potential results. Possible values are: "none", "moderate" and "strict". The MSF provider is responsible for the association of these filtering levels to specific criteria, e.g. as those criteria may vary by region.
Language	0…1	String	Indicate the language of the results. Refer to BCP 47 "Tags for Identifying Languages" [BCP 47] for the available language vocabulary.
Site	0…N	String	Restricts the search to a specific internet domain.
Count	0…1	Integer	Total number of results requested per page.

Table 6 Information elements in SubscribeRequest message

In addition, the SubscribeRequest MAY contain additional parameters specific for a given SearchDomain extended by the implementation (e.g. for "Restaurant" a specific criteria is the type of food such as: Chinese, vegetarian, Italian, …; or the price range, …).

5.2.3.2 SubscribeConfirmation

Information Element	Cardinality	XML Type	Type	Description
SubscribeConf irmation	1	E		Indicate the name of the message
Subscription-	1	A	String	Identifies this subscription. The Subscription-ID is

ID				generated by MSAS and is unique among all the subscription maintained by this MSAS.
Status-Code	1	A	String	The Status of the subscribe request. There should be one option to identify a successful subscription, and at least one option to identify the reason of an unsuccessful subscription.

Table 7: Information elements in SubscribeConfirmation message

5.2.4 Question & Answer

The following two messages are defined for Q&A request and response respectively.
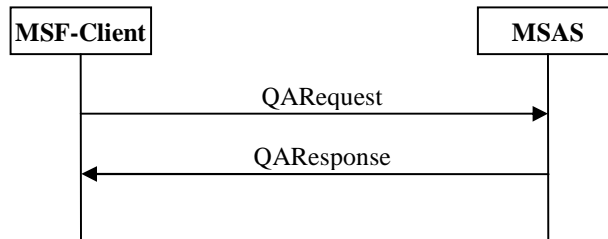
Figure 4: Flow for Subscribe Request and its response

Message	Requirement	Direction
QARequest	Mandatory	MSF-Client → MSAS
QAResponse	Mandatory	MSF-Client ← MSAS

5.2.4.1 QARequest

Name	Cardinality	Data Type	Description
Question	1	String	The string representing the real question being submitted
QA-Field	0…1	String	The string representing the QA Field provided by the MSF-Client.
Client-ID	1	String	See the description in section 5.1
Ans-History	0..1	Boolean	Indicate whether answers are required form Answer History or from Experts. If True, indicates answers are required instantly form Answer History. If FALSE, indicates answers are required form Experts. The default value is FALSE.
Language	0…1	String	Indicate the language of the results. Refer to BCP 47 "Tags for Identifying Languages" [BCP 47] for the available language vocabulary.
ContentFilter	0…1	String	Indicates the level of answers filtering desired based upon sensitivity of user to the potential results. Possible values are: "none", "moderate" and "strict". The MSF provider is responsible for the association of these filtering levels to specific criteria, e.g. as those criteria may vary by region.
Lat	0…1	Float	Target location in terms of Latitude, alternative to the current user location
Lon	0…1	Float	Target location in terms of Longitude, alternative to the current user location
Region	0…N	String	A string representation of a sub-division inside a country as specified in [ISO 3166]. This indicates the target region to be considered, alternative to the current user location.
Count	0…1	Integer	Total number of results requested per page.

Table 8: QARequest message

5.2.4.2 QAResponse

The QAResponse message SHALL be formatted as Atom feed according to [RFC4287].

The following table shows the Atom representation of the elements of the QAResponse feed. In addition, this specification uses some of the OpenSearch 1.1 Response elements in QAResponse feeds.

Unless indicated otherwise, the XML elements in the "Atom Representation" column are in the Atom namespace and defined in [RFC4287]. In particular, items containing the "openSearch:" prefix are defined in [OPENSEARCH].

Other Atom elements or any extension not indicated in this table MAY be included in the QAResponse to provide further information.

Note: This summary uses standard XPath notation: in particular, slashes show the element hierarchy, and an @ sign indicates an attribute of an element.

Feed Schema Item	Cardinality	Atom Representation	Description
Question ID	1 (as per [RFC4287])	`/feed/id`	Identify the question to which belongs this response and related answers.
Response Title	1 (as per [RFC4287])	`/feed/title`	A title representation of the QAResponse
Response Last Update Date	1 (as per [RFC4287])	`/feed/updated`	Identifies the date of the QAResponse last update (or generation)
QAResponse Author	1…N (as per [RFC4287])	`/feed/author`	The author/source(s) of the QAResponse, such as the identifier or name of MSS/Expert(s) (Provider/Expert ID). See [RFC4287] for more details about requirements on this item.
Total-answer-no	0…1	`/feed/openSearch:totalResults`	Total number of answers found for this question.
Answer-num	0…1	`/feed/openSearch:itemsPerPage`	Total number of answers returned in this response (page).
Current-start-index	0…1	`/feed/openSearch:startIndex`	The index of the first answer provided to the MSF-Client in this response.

Table 9: QAResponse message Atom representation

Each QAResponse feed SHALL contain a list of answers, formatted in Atom entries. The elements of a QAResponse answer entry are detailed in section 8.2.13.

5.2.5   Feedback

The Feedback operation from MSF-Client to the MSAS is performed over the MSF-1 interface and it is used to provide Feedback about results. This function consists of two messages:
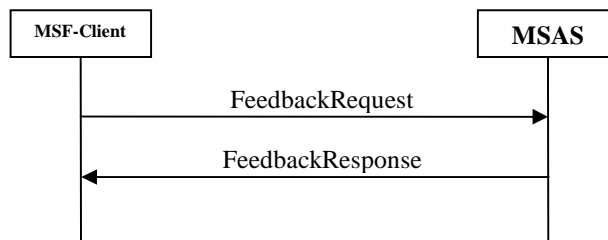
Figure 5: Flow for Feedback Request and its response

Message	Requirement	Direction
FeedbackRequest	Mandatory	MSF-Client → MSAS
FeedbackResponse	Mandatory	MSF-Client ← MSAS

The same messages are used to provide an update on an already existing Feedback.

5.2.5.1   FeedbackRequest

Name	Cardinality	Data Type	Description

Result_ID	1	String	Identify the specific result or answer on which the user provides his Feedback	
Client-ID	1	String	See the description in section 5.1	
RequestID	1	String	Identify the request to which belongs the result	
Feedback	1	Structure	Contains the Feedback provided or updated by the user	

Table 10: FeedbackRequest message

5.2.5.2   FeedbackResponse

Name	XML Type	Cardinality	Data Type	Description
FeedbackResponse	E	1		Indicates the name of the message.
Status-Code	A	1	String	Defined in section 8.2.12.

Table 11: FeedbackResponse message

5.2.6   Next Page

In case the total result found for the initial client request is more than the total number of result returned to the user, MSF-Client can use NextPageRequest message to request for the next set/page of results or answers, formatted as SearchResponse or QAResponse message.
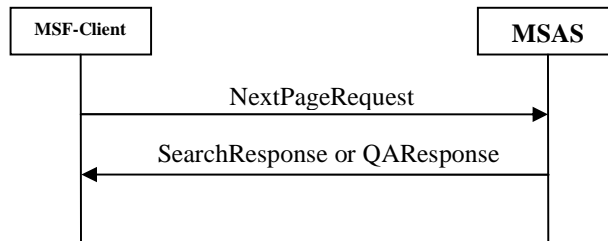
Figure 6: Flow for Next Page Request and its response

Message	Requirement	Direction
NextPageRequest	Mandatory	MSF-Client → MSAS
SearchResponse or QAResponse	Mandatory	MSAS → MSF-Client

5.2.6.1   NextPageRequest

Information Element	Cardinality	Type	Description
Request-ID	1	String	The identifier for the request or question. This ID is returned by MSAS to MSF-Client in the initial set/page of results or answer returned.
Client-ID	1	String	See the description in section 5.1
Start-Index	1	Integer	The requested start index.

Table 12: Information elements in NextPageRequest message

5.3   MSF-2

5.3.1   Search Forward

MSAS forwards the search request to MSS and get back the response on MSF-2. SearchRequest and SearchResponse messages are re-used for request and response respectively with added clarifications.
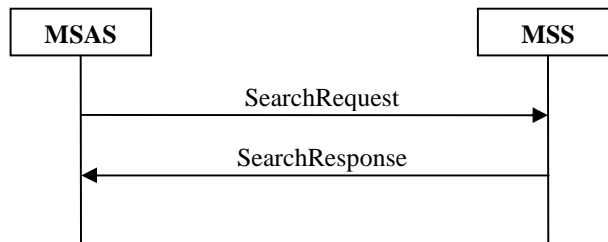
Figure 7: Flow for SearchRequest forward and its response

Message	Requirement	Direction
SearchRequest	Mandatory	MSAS → MSS
SearchResponse	Mandatory	MSAS ← MSS

5.3.1.1   SearchRequest

MSAS forwards the search request to MSS using SearchRequest message defined in section 5.2.2.1 with the following additional parameters.

Name	Cardinality	Data Type	Description
MSAS-ID	1	String	See the description in section 5.1.
Request-ID	1	String	A unique identifier of a request.
User-im	0…1	Structure	User Interest Model as defined in 8.2.2.
userLat	0…1	float	User current location in terms of Latitude.
userLon	0…1	float	User current location in terms of Longitude

Table 13: additional parameters to the SearchRequest message

5.3.2   Question & Answer Forward

MSAS forwards the question request to MSS and gets back the response on MSF-2. QARequest and QAResponse messages are re-used for request and response respectively with added clarifications.
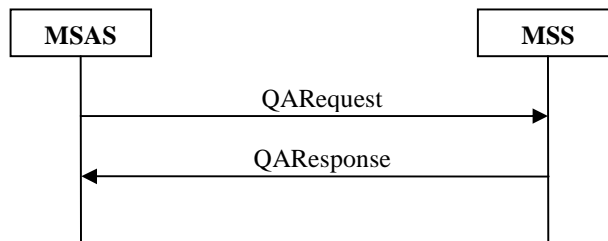
Figure 8: Flow for QARequest forward and its response

Message	Requirement	Direction
QARequest	Mandatory	MSAS → MSS
QAResponse	Mandatory	MSAS ← MSS

5.3.2.1   QARequest

MSAS forwards the question request to MSS using QARequest message defined in section 5.2.4.1 with the following additional parameters:

Name	Cardinality	Data Type	Description
MSAS-ID	1	String	See the description in section 5.1
Question-ID	1	String	Refer to section 5.1
Expert-ID	0…N	String	Selected Expert identification.
userLat	0…1	float	User current location in terms of Latitude.

userLon	0…1	float	User current location in terms of Longitude

Table 14: additional parameters to the QARequest message

5.3.3   Feedback Forward

The Feedback Forward operation from MSAS to the MSS is performed over the MSF-2 interface and it is used to propagate Feedback about results. FeedbackRequest and FeedbackResponse messages are re-used for request and response respectively.
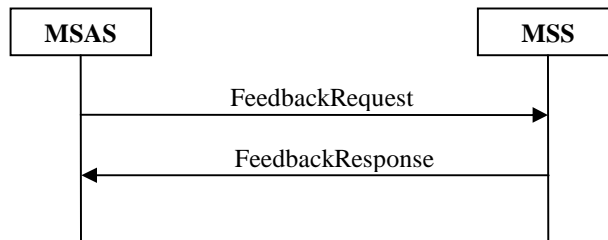
Figure 9: Flow for Feedback Request forward and its response

Message	Requirement	Direction
FeedbackRequest	Mandatory	MSAS → MSS
FeedbackResponse	Mandatory	MSAS ← MSS

The same messages are used to provide an update on an already existing Feedback.

5.4   MSF-3

On the MSF-3 the following operations are performed: registration of SE or MSS, Meta-Index submission from SE or MSS. The following picture shows the messages flow for each operation.
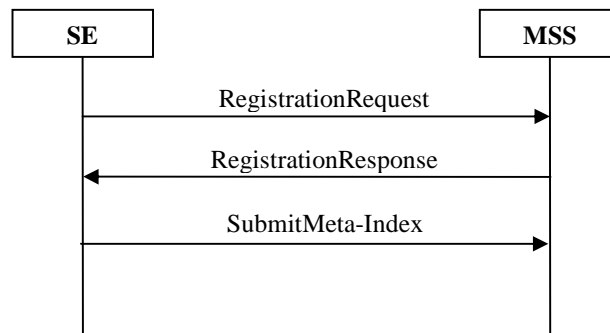
Figure 10: Registration Process

5.4.1   SE and MSS Registration

MSrchFramework enabler enables SE and MSS to register with it using this interface. This registration is required for fulfilling various requirements including SE selection, request transformation. In this registration process, SE and MSS submit their basic information (RegistrationRequest) to the MSS, which responses back (RegistrationResponse) with the unique Provider-ID.

This message can also be used to update registration information.

5.4.1.1   RegistrationRequest

The registration request is an OpenSearch descriptor document in addition with some other information defined by this enabler

Until and unless specified the value of DataType and Cardinality columns are specified in [OpenSearch].

Name	Cardinality	Data Type	Description
ShortName			Name of SE or MSS provider
Description			Indicates the description related to the SE or MSS meant for human readers. e.g. phone, email, description, etc.
Url			Opensearch URL template. The "Type" attribute SHALL contain "application/Atom+xml" [PARA-EXT] can be used to request parameters in the body of the request, in addition to URL.
SE	1…N	Structure	In case of MSS registration it will contain the information about the various SEs registered with the registering MSS. In case of SE registration it contains information about the registering SE. The structure is defined in Section 8.2.18.

Table 15: RegistrationRequest

5.4.1.2   RegistrationResponse

Name	XML Type	Cardinality	Data Type	Description
RegistrationResponse	E	1		Indicate the name of the message
Provider-ID	E1	1	String	The unique ID locally generated associated with the registering/updating SE or MSS.
ConfirmedList	E1	0…N	String	Required SE's ID (Provider-ID). The SE can be selected based on Search Domain information provided in SE structure. The absence of this parameter will imply that Meta-Index for all the SE(s) mentioned by SE structure is required. This parameter SHALL NOT be present in case of SE Registration.
Status-Code	A	1	String	Status of the request

Table 16: RegistrationResponse

5.4.2   Meta-Index Submission

Once the SE or MSS is registered, it submits its Meta-Index (SubmitMeta-Index) to MSS. The Meta-Index consists of terms and Search Domain statistics. Term statistics aims to provide Term Frequency, for all the terms, across all the documents. Whereas, Search Domain statistics aims to provide Domain Relevance of all the documents in the SE's database. The main purpose of Meta-Index is to provide enough information about the SE, so that an appropriate SE can be selected for a particular request. The following message can also be used to update meta-index.

5.4.2.1   SubmitMeta-Index Request

Name	Cardinality	Data Type	Description
Meta-Index	1…N	List of Structure	Structure containing SEs Meta-Index. In case of SE, it has only one occurrence, providing Meta-Index for the registering SE. In case of MSS, it has more than one occurrence, providing Meta-Index for each SE registered to registering MSS respectively.

Table 17: SubmitMeta-Index Request

5.4.2.2   SubmitMeta-Index Response

Name	Cardinality	Data Type	Description
Status-Code	1	String	Status of the request

Table 18: SubmitMeta-Index Response

5.4.3   Questions Retrieve

Experts retrieve questions from the MSS using QRetrieveRequest message. Experts get questions not yet answered related to the topic requested in QRetrieveResponse. Later the answer may be delivered back to MSS in QAResponse message.
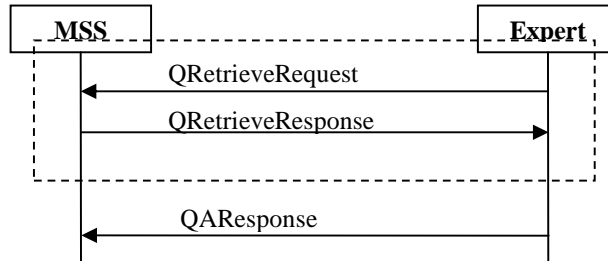
Figure 11: Questions Retrieve

Message	Requirement	Direction
QRetrieveRequest	Optional	MSS ← Expert
QRetrieveResponse	Optional	MSS → Expert
QAResponse	Optional	MSS ← Expert

5.4.3.1   QRetrieveRequest

Name	Cardinality	Data Type	Description
QA-Field	0…N	String	The string representing the QA Field(s) to which the requested questions must belong. If this parameter is not included, all unanswered questions will be returned.
count	0…1	Integer	Total number of result questions requested
language	0…1	String	Indicate the language of the results. Refer to BCP 47 "Tags for Identifying Languages" [BCP 47] for the available language vocabulary.
lat	0…1	Float	Target location in terms of Latitude
lon	0…1	Float	Target location in terms of Longitude
region	0….N	String	A string representation of a sub-division inside a country as specified in [ISO 3166].
contentFilter	0…1	String	Indicates the level of questions filtering desired based upon sensitivity of user to the potential results. Possible values are: "none", "moderate" and "strict". The MSF provider is responsible for the association of these filtering levels to specific criteria, e.g. as those criteria may vary by region.

Table 19: QRetrieveRequest message

5.4.3.2   QRetrieveResponse

Name	XML Type	Cardinality	Data Type	Description
QRetrieveResponse	E	1		Indicate the name of the message
Questions	E1	1…N	Structure	The string representing the real question being submitted

Table-20 QRetrieveResponse message

5.5   MSF-4

5.5.1   Search Dispatch

This interface is used by MSS to send search request and get back the corresponding response(s). SearchDispatchRequest message is defined of request and SearchResponse message is reused for response.

The basic interaction model is shown in Figure 1. The following section describes the detail parameters included in these two messages.
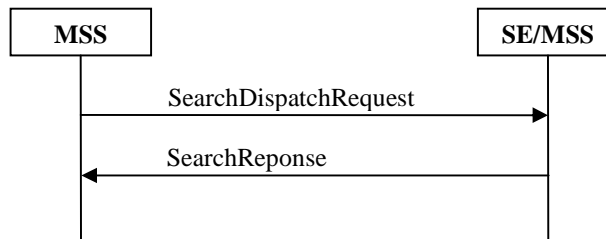
Figure 12: Search dispatch Interaction

Message	Requirement	Direction
SearchDispatchRequest	Mandatory	MSS → SE
SearchResponse	Mandatory	MSS ← SE

5.5.1.1   SearchDispatchRequest

Until and unless specified the values for XML Type and Cardinality column will be determined from descriptor document provided at the time of registration.

The following table illustrates the list of parameters from [OpenSearch], [GeoRSS] and specifically defined by this enabler that MAY be inserted in the Search Request Dispatch. In addition, parameters defined in section 8.3 MAY also be inserted in this request. The actual set of parameters (and related names) sent to SE will depend on the description provided by SE at the time of registration.

Name	Data Type	Description
searchTerms	opensearch:searchTerms	Search keywords
inputEncoding	opensearch:inputEncoding	URL encoding format for different language e.g. GBK for Chinese, UTF-8 for global
geo:lat	geo:lat	User current location in terms of Latitude.
geo:lon	geo:lon	User current location in terms of Longitude

Table 21: SearchDispatchRequest

In addition, the SearchDispatchRequest MAY contain additional parameters specific for a given SearchDomain extended by the implementation (e.g. for "Restaurant" a specific criteria is the type of food such as: Chinese, vegetarian, Italian, …; or the price range, …).

5.5.2   Question & Answer Dispatch

MSS dispatches the request to the selected Expert using QADispatchRequest message. MSS gets the instant delivery confirmation from the expert in QADispatchConfirmation. Later the answer may be delivered back to MSS in QAResponse message.
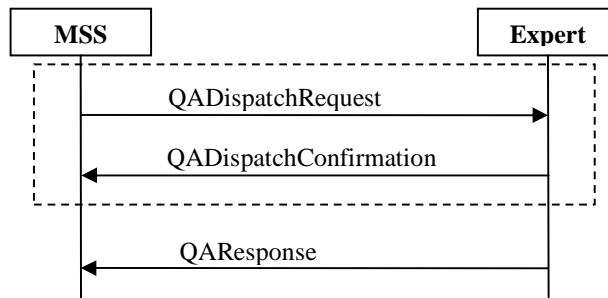
Figure 13: Question & Answer Dispatch

Message	Requirement	Direction
QADispatchRequest	Optional	MSS → Expert
QADispatchConfirmation	Optional	MSS ← Expert
QAResponse	Optional	MSS ← Expert

5.5.2.1 QADispatchRequest

Name	XML Type	Cardinality	Data Type	Description
QADispatchRequest	E	1		Indicate the name of the message
MSS-ID	A	1	String	See the description in section 5.1
Question	E1	1	String	The string representing the real question being submitted
Question-ID	E1	1	Stirng	Refer to section 5.1

Table 22: QADispatchRequest message

5.5.2.2 QADispatchConfirmation

Name	XML Type	Cardinality	Data Type	Description
QADispatchConfirmation	E	1		Indicate the name of the message
Status-Code	A	1	String	Status of the request
Question-ID	E1	1	Stirng	Refer to section 5.1

Table-23 QADispatchConfirmation message

5.5.3 Feedback Dispatch

The FeedbackDispatch operation from MSS to MSF-Source is performed over the MSF-4 interface and it is used to propagate Feedback about results. This function consists of two messages:
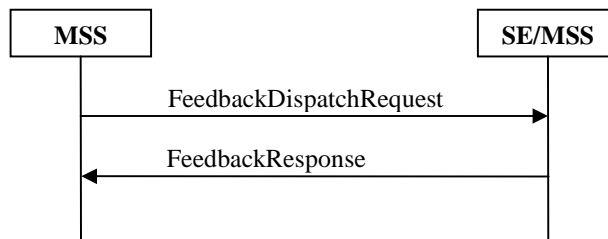
**Figure 14: Personalized Search Interaction**

Message	Requirement	Direction
FeedbackDispatchRequest	Mandatory	MSS → SE
FeedbackResponse	Mandatory	MSS ← SE

The same messages are used to provide an update on an already existing Feedback.

5.5.3.1   FeedbackDispatchRequest

Name	XML Type	Cardinality	Data Type	Description
FeedbackDispatchRequest	E	1		Indicate the name of the message
Result-ID	E1	1	String	Identify the specific result on which the user provides his Feedback. This is same as what was returned by MSF-Source in the search response.
Feedback	E1	1	structure	Contains the Feedback provided or updated by the user
Request-ID	E1	1	String	A unique identifier of a request.

Table 24: FeedbackDispatchRequest message

5.6   MSF-5

5.6.1   Notify

MSAS uses MSF-5 interface to return the results for a subscription made using SubscribeRequest on MSF-1. The NotifyRequest message is defined for this purpose.

5.6.1.1   NotifyRequest

The NotifyRequest message SHALL be formatted similarly to SearchResponse message defined in 5.2.2.2 with the following clarification: the feed id (also referred to as "Request-ID" feed schema item) SHALL contain the value of the Subscription-ID provided to the MSF-Client in the SubscribeConfirmation message of the related subscription.

6. Architectural Entities definition

6.1 MSF-Client Functionalities

When sending requests on MSF-1 interface, MSF-Client MAY insert user authentication and authorization information. If challenged by MSAS, it SHALL insert user authentication and authorization information in the request.

In order to configure the target MSAS to which MSF-Client sends requests on MSF-1, a Management Object for MSF-Client configuration is defined in [MSFCC MO-TS]. The MSFCC MO consists of a list of MSAS entries; each of them containing a list of related configuration parameters.

If the MSFCC MO is provisioned on the terminal, then the MSF-Client MUST use the value of the ClientID provisioned in the MSFCC MO as Client-ID parameter when sending requests on MSF-1 interface, as specified in [MSFCC MO-TS].

6.1.1 Q&A request

To send a Q&A request to MSAS MSF-Client SHALL perform the following steps:

- MSF-Client SHALL create a request using QARequest message.

- If the MSFCC MO is provisioned on the terminal, then the MSF-Client SHALL select one of the MSAS entries, which matches all of the following conditions:
    - The MSAS entry supports the "Q&A" value as SearchFunction.
    - A DomainName of this MSAS entry matches the "QAField" parameter of the QARequest if present.

- If the MSFCC MO is provisioned on the terminal, then the MSF-Client SHALL use the information contained in the entry of the selected MSAS using the procedures below:
    - If a "Language" entry is provisioned, MSF-Client MUST delete any existing "language" parameter in the QARequest message and insert the entry value.

- If the MSFCC MO is provisioned on the terminal, then the MSF-Client SHALL send the QARequest to the URL entry of the selected MSAS.

6.1.2 Subscribe request

To subscribe, MSF-Client SHALL perform the following steps:

- MSF-Client SHALL create a subscribe request using SuibscribeRequest message.

- If the MSFCC MO is provisioned on the terminal, then the MSF-Client SHALL check the SubscriptionDuration entry in the MSFCC MO. If provisioned, MSF-Client SHALL include the value of the SubscriptionDuration entry as "Duration" parameter in the SubscribeRequest.

- If the MSFCC MO is provisioned on the terminal, then the MSF-Client SHALL select one of the MSAS entries, which matches all of the following conditions:
    - The MSAS entry supports the "Subscribe-Push" value as SearchFunction.
    - The MSAS entry supports the "Recommendation" value as SearchFunction if the SubscribeRequest contains at least one "RecommendationAl" parameter.
    - The MSAS entry supports the "Multimedia" value as SearchFunction if the SubscribeRequest contains a "Content" or "Content_URL" parameter.
    - The MSAS entry supports the "Free-text" value as SearchFunction if the SubscribeRequest contains a "searchTerms" parameter.

- o The MSAS entry supports the "byKeyword" value as SearchFunction if the SubscribeRequest contains a "Tags" parameter.

- o A DomainName of this MSAS entry matches the "Domain-Name" parameter of the SubscribeRequest if present.

- If the MSFCC MO is provisioned on the terminal, then the MSF-Client SHALL use the information contained in the entry of the selected MSAS using the procedures below:
    - o If a "Language" entry is provisioned, MSF-Client MUST delete any existing "language" parameter in the SubscribeRequest message and insert the entry value.

    - o If a "ContentFilter" entry is provisioned, MSF-Client MUST delete any existing "contentFilter" parameter in the SubscribeRequest message and insert the entry value.

    - o If a list of "Site" entries is provisioned, MSF-Client MUST delete all existing "site" parameters in the SubscribeRequest message and insert the entry values.

    - o If a list of "RecAlg" entries is provisioned, MSF-Client MUST delete all existing "RecommendationAl" parameters in the SubscribeRequest message and insert the entry values.

- If the MSFCC MO is provisioned on the terminal, MSF-Client SHALL send the SubscribeRequest to the URL entry of the selected MSAS.

6.1.3 Search request

To send a search request, MSF-Client SHALL perform the following steps:

- MSF-Client SHALL create a search request using SearchRequest message.

- If the MSFCC MO is provisioned on the terminal, then the MSF-Client SHALL select one of the MSAS entries, which matches all of the following conditions
    - o The MSAS entry supports the "Subscribe-Push" value as SearchFunction if the SearchRequest contains a "Receiver-ID" parameter

    - o The MSAS entry supports the "Recommendation" value as SearchFunction if the SearchRequest contains at least one "RecommendationAl" parameter

    - o The MSAS entry supports the "Multimedia" value as SearchFunction if the SearchRequest contains a "Content" or "Content_URL" parameter

    - o The MSAS entry supports the "Free-text" value as SearchFunction if the SearchRequest contains a "searchTerms" parameter

    - o The MSAS entry supports the "byKeyword" value as SearchFunction if the SearchRequest contains a "Tags" parameter

    - o A DomainName of this MSAS entry matches the "Domain-Name" parameter of the SearchRequest if present.

- If the MSFCC MO is provisioned on the terminal, then the MSF-Client SHALL use the information contained in the entry of the selected MSAS using the procedures below:
    - o If a "Language" entry is provisioned, MSF-Client MUST delete any existing "language" parameter in the SearchRequest message and insert the entry value

    - o If a "ContentFilter" entry is provisioned, MSF-Client MUST delete any existing "contentFilter" parameter in the SearchRequest message and insert the entry value

- o If a list of "Site" entries is provisioned, MSF-Client MUST delete all existing "site" parameters in the SearchRequest message and insert the entry values

- o If a list of "RecAlg" entries is provisioned, MSF-Client MUST delete all existing "RecommendationAl" parameters in the SearchRequest message and insert the entry values

- If the MSFCC MO is provisioned on the terminal, MSF-Client SHALL send the SearchRequest to the URL entry of the selected MSAS.

6.1.4 NextPage request

To request for next set of results/answers, MSF-Client SHALL perform the following steps:

- MSF-Client SHALL send a request using NextPageRequest message to the same MSAS than the related SearchRequest or QARequest.

6.1.5 Feedback request

After receiving responses containing results or answers (from search, subscribe and Q&A) the MSF-Client MAY send to MSAS a FeedbackRequest message containing the indication of the interaction performed by the user over a result. The target MSAS for the FeedbackRequest SHALL be the same MSAS than the related SearchRequest, SubscribeRequest or QARequest.

If the user feedback corresponds to an explicit vote, rating, comment or review action, then the MSF-Client SHALL include in the FeedbackRequest at least one of "vote" or "comment" parameters. In addition the "taglist" parameter MAY be specified.

If the user feedback corresponds to a click on a link related to a result or answer, then the MSF-Client SHALL include in the FeedbackRequest an "action" parameter with "click" as value.

If the user feedback corresponds to bookmark action on a link related to a result or answer, then the MSF-Client SHALL include in the FeedbackRequest an "action" parameter with "bookmark" as value.

6.1.6 QueryCapabilities request

To send a query capabilities request MSF-Client SHALL perform the following steps:

- MSF-Client SHALL send a query capabilities request to an MSAS using QueryCapabilitiesRequest message.

6.2 MSAS Functionalities

When receiving requests on MSF-1 interface, MSAS MAY require user authentication and authorization information and challenge the MSF-Client

6.2.1 QueryCapabilities Handling

When receiving a QueryCapabilitiesRequest message on MSF-1 interface,

- The MSAS SHALL read the list of "CapabilityName" requested.

- For each "CapabilityName" requested,

  - o it SHALL check whether the capability is supported

  - o if the capability is supported:
    - When "SearchFunctionality" is requested, the MSAS SHALL retrieve the list of search functionalities currently enabled
    - When "RecommendationAlg" is requested, the MSAS SHALL check if the SearchFunctionality "Recommendation" is currently enabled and then SHALL retrieve the list of recommendation

algorithm(s) supported.
- ▪ When "InputType" is requested, the MSAS SHALL check if the SearchFunctionality "Multimedia" is currently enabled and then SHALL retrieve the list of MIME type(s) supported.
- ▪ When "SearchDomain" is requested, the MSAS SHALL retrieve the list of search domain names supported.
- ▪ When "PerformancePar" is requested, the MSAS SHALL retrieve the information related to the performance parameter requested in the PerformancePar structure.
- o instead, if the capability is not supported, it SHALL return the indication that the capability is not supported.
- o it SHALL include the retrieved information, about the capabilities requested, in the QueryCapabilitiesResponse according to format supported on MSF-1.

- The MSAS SHALL send back the QueryCapabilitiesResponse to the requesting MSF-Client.

6.2.2   Search Request Handling

On receiving a search request from MSF-Client on MSF-1 MSAS SHALL perform the following steps.

- MSAS SHALL generate User Interest Model. What should constitute UIM is described in section 8.2.2. The UIM is formed by performing data mining in user profile, Search History, Feedback/Interaction, etc. The exact formation mechanism is considered out-of-scope and left for implementations.

- If a Search Domain is not specified in the search request, MSAS SHALL assign an appropriate Search Domain to the search request. The objective is to find the best available Search Domain for a particular request from a particular user. In order to find the appropriate Search Domain, all the available Search Domains are ranked as per their relevance. Following three relevance factors are considered. The sum all of the three factor forms the Search Domain's final relevance.
    - o Similarity with search query: This considers how related the query (search keywords) is with a particular Search Domain. For example, the following steps can be performed
        - ▪ Define a query vector as $Q(q_1, q_2, q_3, ….q_n)$. Where, qi is the rank (importance) of a keyword k_i in the query.
        - ▪ Define a Search Domain vector as $D(d_1, d_2, d_3, … d_n)$. Where, d_i is the rank (relevance) of the Search Domain with the corresponding keyword k_i.
        - ▪ Compute the similarity between the two vector using cosine similarity algorithms.
    - o Search Popularity: This considers the rate (number) of public search for this particular query, in a particular Search Domain, among the entire clientele. The rate of public search can be known by the total number of searches being performed with particular search keyword and Search Domain pair. Alternatively, it can be knows by the total number of user Interaction on the results produced by a particular search keyword and Search Domain pair. For example, the following steps can be performed
        - ▪ Computer the rate (number) of public search for each keyword in the query for a Search Domain.
        - ▪ Sum up the values of each keyword for a particular Search Domain.
        - ▪ Normalize the resultant value.
    - o User's preference: This considers the user's preference in Search Domains. The Inter-Domain interest model is used for this purpose. The dimensions of user's Inter-Domain interest domain will provide user's preference in particular Search Domain.

- The MSAS SHALL remove the "Client-ID" parameter from the SearchRequest message.

- MSAS SHALL then forward the request to MSS on MSF-2.

6.2.3   Search Response Handling

After receiving search response, in SearchResponse message, from MSS on MSF-2, MSAS SHALL perform the following actions

- Apply the recommendation algorithm(s), mentioned in the SearchRequest message, to the results provided in the SearchResponse message as per the Search History & Recommendation function.

- If the response is for a search request made against a subscription from MSF-Client, MSAS SHALL forward the search response to the intended receiver (indicated by the Receiver-ID parameter in the subscription request) in NotifyRequest message on MSF-5. The response will be asynchronous.

- If the response is for a search request made against a search request from MSF-Client MSAS SHALL forward the search response to MSF-Client in SearchResponse message on MSF-1 if the Receiver-ID parameter was missing. In case the Receiver-ID parameter was present in the corresponding search request, the MSAS SHALL forward the search response to the MSF-Client on MSF-5 (being referred to by Receiver-ID parameter) instead of MSF-1.

6.2.4   Question Request Handling

After receiving QARequest message from MSF-Client on MSF-1, MSAS SHALL perform the following steps.

- Provide the acknowledgment for the QARequest message using out-of-scope mechanism.

- In case a QA Field is not specified by the user, MSAS SHALL assign a QA Field to the question request. It is RECOMMENDED that QA Field be similar with Search Domain. As such the mechanism for Search Domain mapping applies here as well.

- Select one or more Experts to answer the question posted. The selection is performed based on Expert Rank. Expert Rank is calculated/maintained based on the following factors but not limited to.

    o   Number of times user providing positive feedback (best answer) for the answers provided by the particular Expert.

    o   Number of times particular Experts answering question from the user.

    o   Number of times user clicks on the answers provided by the particular Expert.

    Note: In the above three bullets "user" is referring to the "question submitter" (user who is actually submitting the question) as well as all the other MSrchFramework users.

- The MSAS SHALL remove the "Client-ID" parameter from the QARequest message.

- Forwards the request to MSS using QARequest message with additional parameters on MSF-2.

6.2.5   Question Response Handling

After receiving QAResponse message from MSS, MSAS SHALL perform the following steps.

- MSAS sort the answers. The sorting is performed based on Expert Rank as specified in section 6.2.4.

- MSAS SHALL return the response back to MSF-Client in QAResponse message.

6.2.6   Subscribe Request Handling

After receiving Subscribe request from MSF-Client, MSAS SHALL perform the following steps.

- MSAS SHALL initiate generation of search request according to the triggering conditions specified in Trigger-Criteria structure present in subscribes request from MSF-Client.

- MSAS SHALL generate search request according to the procedures specified in section 6.2.2.

- MSAS SHALL then forward search request to MSS using SearchRequest message.

Note: For MSS, this will be a mere search request.

6.2.7 Feedback Handling

When receiving a Feedback request message on MSF-1 interface, the MSAS SHALL perform the following actions:

- Store the feedback received and associate it to user and related result;

- If there is the agreement between service provider and MSF-Source to propagate Feedback received, then the MSAS

SHALL remove the "Client-ID" parameter from the FeedbackRequest message and propagate the FeedbackRequest message over MSF-2.

If the feedback received pertains to an advertisement, the MSAS SHALL NOT propagate the Feedback to MSS. However the MSAS MAY send to the Ad Server on MobAd-2 the SPAppMetricsReport message as defined in [OMA-MobAd-TS].

6.2.8 Targeted Advertising Handling

After receiving the SearchRequest, SubscribeRequest and QARequest from MSF-Client, the MSAS MAY act as SP App (Service Provider Application) and request for targeted advertisements from Ad Server (Advertising Server) , via MobAd-2 interface, using the SPAppAdRequest message as defined in [OMA-MobAd-TS] with the following clarifications:

- The searchTerms or Tags in the SearchRequest, SubscribeRequest MAY be included in the SPAppAdRequest as ContextKeyword.

- The Question in the QARequest MAY be included in the SPAppAdRequest as ContextKeyword.

- The Client-ID in the SearchRequest, SubscribeRequest and QARequest MAY be used to generate the PrincipalID in the SPAppAdRequest. The MSAS-ID MAY be used as SPAppID in the SPAppAdRequest.

After receiving advertisement(s) in the SPAppAdResponse message from Ad Server, the MSAS MAY insert advertisement(s) into the search results and deliver them to the MSF-Client in the SearchResponse, QAResponse and NotifyRequest. The format of the advertisement SHALL be an Atom "entry" according to [RFC4287].

After delivering the advertisement(s) to MSF-Client, the MSAS SHALL send to the Ad Server on MobAd-2 the SPAppMetricsReport message as defined in [OMA-MobAD].

6.3 MSS Functionalities

6.3.1 Search Request Handling

6.3.1.1 From MSAS

When receiving a search request on MSF-2 interface, MSS perform the following actions:

- It SHALL check whether at least a SE is available for the requested Search-Domain. If no SE is available the MSS SHALL send an error message describing un-availability of the appropriate SE.
- In case one or more appropriate SE is available, the MSS SHALL select the appropriate SE(s). Several kind of SE selection are enabled such as:
  - o SE selection based on search query and Meta-Index
  - o SE selection based on search query, Meta-Index, User Interest Model

  In case the selected SE belongs to a different MSS, the search request SHALL be forwarded to the related MSS on MSF-4 using SearchDispatchRequest message as defined in section 5.5.1.1 and SHALL NOT perform the following steps.
- For each SE, MSS SHALL convert the received search request into the request format supported by SE. The conversion is performed based on the mapping information, between search request format supported by MSS and the format supported by SE provided in the registration request. The detail Query Building function is defined in section 6.3.1.1.1.
  Note: If a parameter in search request doesn't map with a particular parameter supported by SE, the implementation may choose any other appropriate parameter, supported by SE, for that particular parameter. An appropriate parameter may be the general search (searchTerms) parameter.

- MSS SHALL collect the entire user related information if requested by the selected SE(s).
- MSS SHALL forward the request to all selected SE(s). MSS SHALL send user related information with the search request as/if requested by SE during registration. MSS SHALL not reveal user identification or point-of-contact in the information being sent.

Some guidelines for SE selection are provided in Appendix C.

6.3.1.1.1 Query Building function

As a part of Query building function, MSS SHALL form a HTTP request according to the specifics provided by SE at the time of registration. MSS:

- SHALL form a HTTP URL using the URL template provided by SE at the time of registration as a part OpenSearch description document.
    - o SHALL carefully replace search parameters (coming on MSF-2) with corresponding URL parameters defined by SE in URL template at the time of registration.
- SHALL embed all the parameters provided as a part of OpenSearch parameter extension [PARA-EXT] in the request.
- SHALL embed other required information (e.g. domain specific information).

6.3.1.2 From MSS

When receiving a search request on MSF-4 interface from another MSS, MSS SHALL perform the following actions:

- MSS SHALL collect the entire user related information if requested by the selected SE(s).
- For each SE, MSS SHALL convert the received search request into the request format supported by SE. The conversion is performed based on the mapping information, between search request format supported by MSS and the format supported by SE provided in the registration request. The detail Query Building function is defined in section 6.3.1.1.1

Note: If a parameter in search request doesn't map with a particular parameter supported by SE, the implementation may choose any other appropriate parameter, supported by SE, for that particular parameter. One of the appropriate parameter may be the general search (searchTerms) parameter.

- MSS SHALL forward the request to all the SE provided in Selected-SE-List parameter in the request. MSS SHALL send user related information with the search request as/if requested by SE during registration. MSS SHALL NOT reveal user private information in the information being sent. The private information refers to any kind of information which may enable SEs to get acquainted with the user

6.3.2 Search Response Handling

On receiving a search response from SE/other MSS on MSF-4, MSS SHALL perform the following steps.

- For each SE, MSS SHALL review/understand the response as atom feeds.
- Depending on the domain mapping information, if provided in the registration request, MSS SHALL convert result format into the format used by this enabler.
- MSS SHALL aggregate the results from all the SE/other MSS.
- MSS SHALL check whether SE/other MSS has returned Personalization Score (calculated rank considering UIM, provided by MSS) with the search result.
    - o In case the Personalization Score is not provided by the SE/other MSS, MSS generates Personalization Score (calculated rank considering UIM, provided by MSAS), for the entire result list, by itself.
    - o MSS re-rank and sort the aggregated results list according to the Personalization Score, Local Rank and the Importance Level.
- It SHALL forward consolidated list of results to MSAS in SearchResponse message on MSF-2.

6.3.3 Question Request Handling

After receiving QARequest message from MSAS, MSS SHALL perform the following steps.

- Provide the acknowledgment for the QARequest message using out-of-scope mechanism.

- Check the value of Ans-History parameter
    - o If the value is TRUE, MSS SHALL get answer from Answer History and return the answer instantly using QAResponse. If no answer is found, MSS SHALL NOT forward the request to Experts, and return an error.
    - o If the value is FALSE, MSS SHALL forward the request to selected experts indicated by MSAS in QARequest message.

6.3.4 Question Response Handling

After receiving an answer response in QAResponse message from Experts, MSS SHALL perform the following steps.

- MSS SHALL aggregate answers provided by all the experts.
- MSS SHALL send the consolidated list of answers to MSAS using QAResponse message.

6.3.5 Registration Request Handling

On receiving the registration request on MSF-3 interface, MSS SHALL perform following actions:

- MSS SHALL check/validate the description document as a valid [OpenSearch] descriptor document
- If the registration request is from a SE, MSS SHALL generate a unique Provider-ID and send that to the SE in RegistrationResponse message. MSS SHALL NOT include ConfirmedList parameter.
- If the registration request is form another MSS, MSS SHALL generates a unique Provider-ID and sends that to the registering MSS in RegistrationResponse message. MSS SHALL include the list of SEs (Source-ID, as provided in SE structure) for which the Meta-Index is required, in ConfirmedList parameter.

6.3.6 Meta-Index Update request handling

On receiving a Meta-Index update request from other MSS, MSS SHALL response back with the required SE(s) list in the RegistrationResponse message.

On receiving an Meta-Index update request from a SE, MSS SHALL duly update the SE's information (including Meta-Index) as specified in the request.

6.3.7 Meta-Index Update

To update a previously submitted Meta-Index, anytime after registration, with MSS, an other MSS SHALL perform following actions:

- It SHALL create a RegistrationRequest message as follows
    - o It SHALL include the list of new (newly registered SE) and updated (SE those have updated their Meta-Index) SEs in SE structure.
    - o It SHALL NOT include General-reg-info parameter.
- Receive, as a response, the required SE(s) list in RegistrationResponse message.
- Submit Meta-Index only for those SE specified in the ConfirmedList message.

6.3.8 MSS Registration

To register with the MSS, other MSS SHALL perform the following actions:

- Other MSS SHALL send the required registration information using RegistrationRequest message.
    - o The RegistrationRequest message is an OpenSearch description document. In addition to the URL Parameters defined by OpenSearch, other MSS may also use the extended URL parameters and other extensions like SE structure defined in this specification.

- Other MSS SHALL submit its Meta-Index, only for those SE mentioned in ConfirmedList parameter of RegistrationResponse message, using SubmitMeta-Index message.

6.3.9 Feedback Handling

When receiving a FeedbackRequest message on MSF-2 interface, the MSS SHALL perform the following actions:

- associate the feedback received to the right result and SE;
- send the FeedbackDispatchRequest message to the SE on MSF-4.

6.3.10 Questions Retrieve Response Handling

After receiving a QRetrieveRequest from Expert, MSS SHALL perform the following steps:

- MSS SHALL check the request parameters against the unanswered questions;
- MSS SHALL send the retrieved list of questions to Expert using QRetrieveResponse message on MSF-3.

6.4 SE Functionalities

6.4.1 Registration

To register with the MSS, SE SHALL perform the following actions

- SE SHALL send the required registration information using RegistrationRequest message
  - o The RegistrationRequest message is an OpenSearch description document.
    - ▪ In addition to the URL Parameters defined by OpenSearch, a SE MAY also use the URL parameters defined in section 8.3 to require user-related information.
    - ▪ The description document MAY also include other information like the SE structure defined in section 8.2.18.
- After receiving RegistrationResponse, SE SHALL submit its Meta-Index using SubmitMeta-Index message.

6.4.2 Search Request Handling

On receiving a search request from MSS on MSF-4 SE SHALL perform the following steps.

- SE SHALL check whether the request contains the User Interest Model (User-im)
  - o If UIM is provided then SE SHALL use it for ranking and sorting the result list produced.
  - o SE SHALL calculate Personalization Score for each result.
- SE SHALL return result list to MSS. SE SHALL include Personalization Score with each result in case it has performed ranking and sorting based on UIM. SE may also include Local Rank calculated as per its own policies.

6.4.3 Meta-Index Update

To update previously submitted Meta-Index, at any time after registration, SE SHALL send a SubmitMeta-Index message to MSS.

6.5 Expert Functionalities

6.5.1 Questions Retrieve Request

To retrieve unanswered questions, Expert SHALL send a request using QRetrieveRequest message on MSF-3 to MSS

7. Protocol Bindings

7.1 HTTP Bindings

7.1.1 General

MSF-Client SHALL support Hypertext Transfer Protocol version 1.1 (HTTP1.1 [RFC2616]) for MSF-1 and MSF-5 interfaces.

MSAS SHALL support Hypertext Transfer Protocol version 1.1 (HTTP1.1 [RFC2616]) for MSF-1 and MSF-2 interfaces.

MSS SHALL support Hypertext Transfer Protocol version 1.1 (HTTP1.1 [RFC2616]) for MSF-2, MSF-3, and MSF-4 interfaces.

SE SHALL support Hypertext Transfer Protocol version 1.1 (HTTP1.1 [RFC2616]) for MSF-3 and MSF-4 interfaces.

7.1.1.1 Media Type

MSF-Client SHALL support messages formatted as entity-bodies with the following media types:

- multipart/form-data media type. The multipart/form-data media type is used on MSF-1 interface when sending the HTTP request.
- application/xml media type. The application/xml media type is used on MSF-1 interface when receiving the HTTP response.

MSAS SHALL support messages formatted as entity-bodies with the following media types:

- multipart/form-data media type. The multipart/form-data media type is used
  - o on MSF-1 interface when receiving the HTTP request;
  - o on MSF-2 interface when sending the HTTP request.
- application/xml media type. The application/xml media type is used
  - o on MSF-1 interface when sending the HTTP response;
  - o on MSF-2 interface when receiving the HTTP response.
- multipart/mixed media type. The multipart/mixed media type is used when multiple MSrchFramework interface messages are concatenated in a single HTTP request/response on MSF-2.

MSS SHALL support messages formatted as entity-bodies with the following media types:

- multipart/form-data media type. The multipart/form-data media type is used
  - o on MSF-2 interface when receiving the HTTP request;
  - o on MSF-4 interface when sending the HTTP request depending on SE registration
- application/x-www-form-urlencoded media type. The application/x-www-form-urlencoded media type is used on MSF-4 interface when sending the HTTP request depending on SE registration
- application/xml media type. The application/xml media type is used when a single MSrchFramework interface message is included in the HTTP request/response
  - o on MSF-2 interface when sending the HTTP response.
  - o on MSF-3 when sending/receiving HTTP request/response.
- multipart/mixed media type. The multipart/mixed media type is used when multiple MSrchFramework interface messages are concatenated in a single HTTP request/response on MSF-2 and MSF-3.

SE SHALL support messages formatted as entity-bodies with the following media types:

- application/x-www-form-urlencoded media type. The application/x-www-form-urlencoded media type is used on MSF-4 interface when receiving the HTTP request depending on SE registration

- application/xml media type. The application/xml media type is used in the HTTP request/response.

7.1.1.2 HTTP Method

All the request messages SHALL be sending as HTTP POST method requests.

The following optional Headers may be included in the request messages.

- the receiver's address in the request line

- the Host request-header set to the hostname or IP address of the receiver.

- the User-Agent request-header set to identify the host device (e.g. "vendor-model/version"), and the name and version of the sender as user agent initiating the request.

- the Accept request-header with value "application/xml, multipart/mixed"

- the Accept-Encoding request-header with value per the supported HTTP compression encodings, i.e. deflate and / or gzip

- the Accept-Language request-header with value per the supported HTTP supported languages(e.g. en, *)

- the Accept-MsgSize is the maximum message size that terminal can handle.

- the Content-Length entity-header set to the length of the entity-body

- the Content-Type entity-header with value "application/xml", "multipart/mixed" or "multipart/form-data" as applicable

- the Interface message(s) as message-body

If any of these headers are not present in the response to the request, the receiver SHALL assume their *default* values.

All the response messages SHALL be sending as response to the corresponding receiver's request as specified by the HTTP 1.1 including:

- Status-Line header reflects the outcome of the HTTP POST request

- the ETag entity-header set to a unique value within the scope of the receiver.

- the Content-Encoding entity-header set to the type of HTTP compression applied, if any

- the Content-Length entity-header set to the length of the entity-body

- the Content-Type entity-header with value "application/xml or "multipart/mixed", as applicable

the Interface message(s) as message-body, if the transaction is successful

7.1.1.3 HTTP Authentication

The MSF-Client and MSAS SHALL support HTTP Digest Authentication mechanisms (HTTP1.1 [RFC2617]) on MSF-1 interface.

7.1.2 MSF-1 Interface Message Bindings

The table below gives an overview of how MSF-1 interface messages are bound to the HTTP based protocol stack.

For each request message MSF-Client MUST add a "message" parameter in the body of the HTTP POST request containing as value the message name as specified in the "Message" column of the following table.

The MSF-1 interface messages MAY include HTTP Digest Authentication information.

Message	MSF-Client ←→ MSAS	HTTP Method
SearchRequest	→	HTTP POST
SearchResponse	←	HTTP Response (including 200 OK of the underlying method)
SubscribeRequest	→	HTTP POST
SubscribeConfirmation	←	HTTP Response (including 200 OK of the underlying method)
QARequest	→	HTTP POST
QAResponse	←	HTTP Response (including 200 OK of the underlying method)
QueryCapabilitiesRequest	→	HTTP POST
QueryCapabilitiesResponse	←	HTTP Response (including 200 OK of the underlying method)
FeedbackRequest	→	HTTP POST
FeedbackResponse	←	HTTP Response (including 200 OK of the underlying method)
NextPageRequest	→	HTTP POST

Table 25: MSF-1 Interface Message Bindings When Uses HTTP Based Stack

7.1.3   MSF-2 Interface Message Bindings

The table below gives an overview of how MSF-2 interface messages are bound to the HTTP based protocol stack.

Message	MSAS ←→ MSS	HTTP Method
SearchRequest	→	HTTP POST
SearchResponse	←	HTTP Response (including 200 OK of the underlying method)
QARequest	→	HTTP POST
QAResponse	←	HTTP Response (including 200 OK of the underlying method)
FeedbackRequest	→	HTTP POST
FeedbackResponse	←	HTTP Response (including 200 OK of the underlying method)

Table 26: MSF-2 Interface Message Bindings When Uses HTTP Based Stack

7.1.4   MSF-3 Interface Message Bindings

The table below gives an overview of how MSF-3 interface messages are bound to the HTTP based protocol stack.

Message	SE / Expert ←→ MSS	HTTP Method
RegistrationRequest	→	HTTP POST
RegistrationResponse	←	HTTP Response (including 200 OK of the underlying method)
SubmitMeta-IndexRequst	→	HTTP POST
SubmitMeta-IndexResponse	←	HTTP Response (including 200 OK of the underlying method)
QRetrieveRequest	→	HTTP POST
QRetrieveResponse	←	HTTP Response (including 200 OK of the underlying method)

Table 27: MSF-3 Interface Message Bindings When Uses HTTP Based Stack

7.1.5 MSF-4 Interface Message Bindings

The table below gives an overview of how MSF-4 interface messages are bound to the HTTP based protocol stack.

Message	MSS ←→ SE	HTTP Method
SearchDispatchRequest	→	HTTP POST Depending on the target SE, some parameter may be sent as URL parameters and/or in the request body
SearchResponse	←	HTTP Response (including 200 OK of the underlying method)
QADispatchRequest	→	HTTP POST
QADispatchConfirmation	←	HTTP Response (including 200 OK of the underlying method)
FeedbackDispatchRequest	→	HTTP POST
FeedbackResponse	←	HTTP Response (including 200 OK of the underlying method)
QAResposne	←	HTTP POST

Table 28: MSF-4 Interface Message Bindings When Uses HTTP Based Stack

7.2 OMA Push Bindings

The MSAS SHALL support either the Push Access Protocol (PAP) [PUSH-PAP] or the Push-OTA protocol [PUSH-OTA] for point-to-point delivery of the following messages over the MSF-5 interface:

- MSF-5 SearchResponse

- MSF-5 NotifyRequest

- MSF-5 QAResponse

Whether to use PAP or Push-OTA is a deployment choice. Among other advantages, use of PAP prevents the MSAS from needing to implement most of the basic functions of OMA Push Proxy Gateway (PPG), e.g. the various Push-OTA protocols and target client context/capabilities awareness (as needed to select the appropriate transport bearer and protocol). Conversely, for high-volume search services limited to Push delivery over a single specific bearer (e.g. WAP1 Push over SMS), use of Push-OTA is fairly simple and avoids dependency upon a Push Proxy Gateway (PPG).

MSrch messages may not be directly deliverable over connectionless bearers such as WAP Push over SMS (limited to about 512 bytes) or SIP Push via the SIP MESSAGE method (limited to about 1300 bytes), as compared to WAP Push over HTTP or SIP Push via the INVITE/MSRP method (both of which support essentially unlimited content size). The alternative to direct delivery is "indirect delivery", which involves the delivery of a Push notification message carrying a content location URL, from which the client retrieves the response.

When using PAP for direct MSrch message delivery, the MSAS SHALL submit the MSrch messages using the MIME content type "application/xml" or "multipart/mixed", as applicable, and MAY support various target client address schemes, e.g. PLMN, USER, SIP URI, IP address, etc.

When directly delivering MSrch messages via Push-OTA, the MSAS SHALL send the MSrch message (headers and message body) encapsulated into a message/vnd.oma.push media type as described in [PUSH-MSG].

To deliver MSF-5 messages indirectly, the MSAS SHALL use the ServiceLoading [PUSH-SL] content type, via either PAP or Push-OTA as applicable, and include a URL from which the MSF-Client can retrieve the actual MSF-5 message. MSF-Clients SHALL support indirect delivery of MSrch messages, triggered by reception of ServiceLoading notifications.

For MSrch Push messages, the MSAS SHALL include the Push Application ID header "X-Wap-Application-Id: x-oma-application:msrch.ua". Push Clients in MSrch supporting terminals SHALL support routing of Push messages with the Push Application ID header "X-Wap-Application-Id: x-oma-application:msrch.ua" to the MSF-Client. If there is no Push Client in the device, the MSF-Client SHALL implement the necessary Push Client functions for the supported Push-OTA protocol variants per [PUSH-OTA].

MSF-Clients SHALL support direct and indirect Push delivery of the MSrch messages:

- MSF-5 SearchResponse

- MSF-5 NotifyRequest

- MSF-5 QAResponse

7.2.1　MSF-5 Interface Message Bindings

The table below gives an overview of how MSF-5 interface messages are bound to the OMA Push-OTA protocol.

Message	MSF-Client ⟵⟶ MSAS	HTTP Method	Push-OTA Binding	PAP Binding
MSF-1: SearchRequest	→	HTTP POST		
MSF-5: SearchResponse	←		Push Message (SearchResponse)	Push Message (SearchResponse)
OR				
MSF-5: SearchResponse Notification	←		ServiceLoading (SearchResponse URL)	Push Message (ServiceLoading (SearchResponse URL))
	→	HTTP GET		
MSF-5:	←	HTTP Response		

Message	MSF-Client ←→ MSAS	HTTP Method	Push-OTA Binding	PAP Binding
SearchResponse		(including 200 OK of the underlying method)		

Table 29: MSF-5 Search Operation Bindings to OMA Push

Message	MSF-Client ←→ MSAS	HTTP Method	Push-OTA Binding	PAP Binding
MSF-5: NotifyRequest	←		Push Message (NotifyRequest)	Push Message (NotifyRequest)
OR				
MSF-5: NotifyRequest Notification	←		ServiceLoading (NotifyRequest URL)	Push Message (ServiceLoading (NotifyRequest URL))
	→	HTTP GET		
MSF-5: NotifyRequest	←	HTTP Response (including 200 OK of the underlying method)		

Table 30: MSF-5 SubscribeResponse Operation Bindings to OMA Push

Message	MSF-Client ←→ MSAS	HTTP Method	Push-OTA Binding	PAP Binding
MSF-1: QARequest	→	HTTP POST		
MSF-5: QAResponse	←		Push Message (QAResponse)	Push Message (QAResponse)
OR				
MSF-5: QAResponse Notification	←		ServiceLoading (QAResponse URL)	Push Message (ServiceLoading (QAResponse URL))
	→	HTTP GET		
MSF-5: QAResponse	←	HTTP Response (including 200 OK of the underlying method)		

Table 31: MSF-5 QA Operation Bindings to OMA Push

8. Data Model

8.1   Data Types

The datatypes of the MSrchFramework parameters used in this specification are defined in the section "Built-in datatypes" of [XML Schema Part 2: Datatypes] specification by the W3C.

8.2   Common parameters and structures

8.2.1   Result Structure

The format of a Result SHALL be an Atom "entry" according to [RFC4287].

The following table shows the Atom representation of the elements of a Result. In addition, this specification uses some of the GeoRSS elements and further defines new elements in Result entries.

Unless indicated otherwise, the XML elements in the "Atom Representation" column are in the Atom namespace and defined in [RFC4287]. In particular, items containing the "geo:" prefix are defined in [GEORSS] specification and items containing the "oma:" prefix are defined in this specification.

Domain-specific parameters or additional general result parameters, e.g. URL, actual content parameters related to multimedia content MAY be added to the Result using other Atom elements as defined in [RFC4287] or any other extension.

Note: This summary uses standard XPath notation: in particular, slashes show the element hierarchy, and an @ sign indicates an attribute of an element.

Entry Schema Item	Cardinality	Atom Representation	Description
Domain-Name	1	/feed/entry/category/@term	Search Domain to which this result belongs to.
Title	1 (as per [RFC4287])	/feed/entry/title	Title of the result. **Conditional:** Mandatory in absence of any related domain specific parameter.
Snippet	0…1	/feed/entry/summary or /feed/entry/content	Snippet (short description) of the search result. **Conditional:** Mandatory in absence of any related domain specific parameter.
Url	0…N	/feed/entry/link	URL of the search result content. **Conditional:** Mandatory in absence of any related domain specific parameter.
Result-ID	1 (as per [RFC4287])	/feed/entry/id	Identifier of the result with in a particular request identified by Request-ID This parameter is used: • by MSF-Source to carry its own resultidentifier , if any; • by MSS to assign a unique identifier on the system.
Pers-score	0…1	/feed/entry/oma:persScore	Personalization Score (calculated rank considering UIM provided by MSS) of a particular search result.
Location	0…1	/feed/entry/georss:point	Entity (extracted form result content e.g. restaurant, park) location: latitude.

		(Simple) or /feed/entry/georss:where (GML)	
Recommendation	0…N	/feed/entry/oma:recommendation	Structure containing information about Recommendation. This parameter is used: • by MSF-Source to carry Feedback from own customers; • by MSAS to provide the calculated Recommendation. See section 8.2.15.
Local-rank	0…1	/feed/entry/oma:localRank	Calculated rank solely according to the SE procedures.
Result author/source	1…N (as per [RFC4287])	/feed/entry/author	The author/source(s) of the Result, such as the identifier or name of Expert(s) or MSS/SE (Provider ID). See [RFC4287] for more details about requirements on this item.
Result Last Update Date	1 (as per [RFC4287])	/feed/entry/updated	Identifies the date of the Result last update (or generation)

Table 32: Result structure

8.2.1.1 PersScore data type

Name	XML Type	Cardinality	Data Type	Description
PersScore	E	1	Float	Personalization Score (calculated rank considering UIM provided by MSS) of a particular search result.

8.2.1.2 LocalRank data type

Name	XML Type	Cardinality	Data Type	Description
LocalRank	E	1	Float	Calculated rank solely according to the SE procedures.

8.2.2 User-im Structure

As stated in [MSrchFramework-AD] User Interest Model provides user preference in particular Search Domain as compare to other Search Domain. It can also further provide users preference in particular category inside the Search Domain. User's interest is divided into several dimensions such as finance, sports, science etc. UIM (User-im) is a vector of those dimensions indicating the score of user's interest in different Search Domain.

Two kinds of User Interest Model are identified: Inter-Domain interest model and Intra-Domain interest model. Inter-Domain model represent user preference in a particular Search Domain as compare to other Search Domain. Whereas, Intra-Domain model represent user preference in a particular Search Sub-Domain compare to other Search Sub-Domain.

Name	XML Type	Cardinality	Data Type	Description
Domain-Name	A	0…1	String	A parameter used to specify a Search Domain in case of Intra-Domain UIM. If not present, imply that the UIM is Inter-Domain.
Dimensions	E	1…N	Structure	A structure specifying: ▪ In case of Inter-Domain interest model, a Search-Domain and the corresponding user's preference in them ▪ In case of Intra-Domain interest model, a Search Sub-Domain and the corresponding user's preference in them.

Table 33: User-im structure

Appendix D provides additional information about User Interest Model.

8.2.2.1 Dimension Structure

Name	XML Type	Cardinality	Data Type	Description
Key	E	1	String	Containing Search-Domain in case of Inter-Domain interest model

					and Search Sub-Domain in case of Intra-Domain interest model
Value	E	1	Float		Containing user preference in terms of a float value from 1 to 0. 1 being the best and 0 being the worst. The actual value for this element is calculated by doing data mining inside e.g. the search history, user profile and feedback/interaction. This specification does not advocate for any specific data mining technology and leave that to implementations.
Type	A	1	Enumeration		Specifying the type of user interest model being conveyed in "Value" parameter. As Enumeration, possible values (not exhaustive) are identified as: • SESSION-BASED: Imply that the float value in "Value" parameter is calculated based on sequence of queries (including current search request) belonging to the same Search Context Session. • GENERAL: Imply that the float value in "Value" parameter is calculated based Search History, user profile and Feedback/Interaction.

Table 34: Dimensions structure

Name	Description
SESSION-BASED	Imply that the float value in "Value" parameter is calculated based on sequence of queries (including current search request) belonging to the same Search Context Session.
GENERAL	Imply that the float value in "Value" parameter is calculated based search history, user profile and feedback/interaction.

Table 35: Type Enumeration

8.2.3   CapabilitiesList Structure

For operations that include CapabilitiestList as an inline message part, the CapabilitiestList information is provided in this data structure.

Name	XML Type	Cardinality	Data Type	Description
SearchFunction ality	E	0…N	Enumeration	Functionality supported by the MSAS (e.g."Q&A", "Subscribe-Push", "Recommendation", "free-text", "byKeyword", "multimedia", …)
Recommendati onAlg	E	0…N	String	Algorithm supported for the "Recommendation" functionality.
InputType	E	0…N	String	MIME type supported as an input search request for the "multimedia" functionality (e.g. "image/jpeg", "audio/mpeg3", "video/avi", …).
Domain-Name	E	0….N	String	Search Domain supported
PerformancePa r	E	0…1	Structure	Performance parameters of the MSAS.

Table 36: CapabilitiesList structure

8.2.3.1   RecommendationAlg reserved strings

The following table defines a list of reserved names for the RecommendationAlg parameter:

Name	Description
User2Item-CF	Collaborative filtering class algorithm: to suggest new items for a particular user based on the user's previous Feedbacks and the Feedbacks of other users having the similar interest.
User2Item-TopN	TopN class algorithm: to suggest the set of top N items based on the Feedbacks received by all users (overall popularity not user-specific).
User2Item-TN	Trust network class algorithm: to suggest a set of items for a particular user based on the explicit Trust Relationships previously defined towards other users.

Table 37: RecommendationAlg reserved strings

8.2.4   CapabilityName Enumeration

Name	Description
SearchFunctionality	List of supported search functionalities by the MSAS (e.g."Q&A", "Subscribe-Push", "Recommendation", "free-text", "byKeyword", "multimedia", …)
RecommendationAlg	List of supported algorithms for the "Recommendation" functionality. This parameter is mandatory, if the "Recommendation" functionality is supported.
InputType	List of MIME types supported as an input search request for the "multimedia" functionality (e.g. "image/jpeg", "audio/mpeg3", "video/avi", …). This parameter is mandatory, if the "multimedia" functionality is supported
Domain-Name	List of Search Domains available
PerformancePar	List of performance parameters.

Table 38: CapabilityName Enumeration

8.2.5   SearchFunctionality Enumeration

List of allowed SearchFunctionality values:

Enumeration	Description
Q&A	Indicates the functionality of Query & Answer
Subscribe-Push	Indicates the functionality of Subscribe-Push
Recommendation	Indicates the functionality of Recommendation.
Free-text	Indicates the possibility to initiate a search request free text
byKeyword	Indicates the possibility to initiate a search request using keywords
multimedia	Indicates the possibility to initiate a search request by sending a multimedia file

Table 39: SearchFunctionality Enumeration

8.2.6   PerformancePar Structure

Name	XML Type	Cardinality	Data Type	Description
MaxRequests	E	0…1	Integer	Maximum number of requests accepted per time or in a period of time
MaxRequests Period	E	0…1	Integer	Period of time related to the MaxRequests parameter expressed in millisecond [ms].
MinInterval	E	0…1	Integer	Minimum interval between two requests expressed in millisecond [ms].
respTime	E	0…1	Integer	Average response time expressed in millisecond [ms].
Timeout	E	0…1	Integer	Timeout of the operations expressed in millisecond [ms].

Table 40: PerformancePar Structure

8.2.7   Search-Domain Structure

Name	XML Type	Cardinality	Data Type	Description
Domain-Name	E	1	String	Search Domain name.
Doc-num	E	1	Int	Total number of document/search records belonging to this particular Search Domain.
Sub-Domain	E	0…N	String	Search Sub-Domain supported by SE.
Domain-Mapping	E	0…N	Structure	Structure containing mapping of the domain specific parameter specified by SE with that of specified by MSF.
Region	E	0…N	String	A string representation of a sub-division inside a country as specified in [ISO 3166]. This indicates the region covered by this Search-Domain.

Table 41: Search-Domain Structure

8.2.8   Meta-Index Structure

Name	XML Type	Cardinality	Data Type	Description

Provider-ID	E	1	String	SE's or MSS's ID.

In case of SE registration this ID must be the Provider-ID provided in the registration response.

In case of MSS registration this ID must be among one of the IDs specified in ConfirmedList parameter of ConfirmSEList message. |
Term-Info	E	1…N	Structure	A structure containing information about all the terms, related to a particular Search Domain, in the documents/records. One Term-Info structure pertains to a particular Search Domain.
Domain-Info	E	1…N	Structure	A structure containing information about all the Search Sub-Domains (belonging to the same Search Domain) relevant to the documents in SE database. One Domain-Info structure aims to one Search Domain.
Search-Domain	E	1	Structure	Search Domain supported by SE
Region	E	0…N	String	A string representation of a sub-division inside a country as specified in [ISO 3166].

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Table 42: Meta-Index Structure

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8.2.9   Term-Info Structure

Name	XML Type	Cardinality	Data Type	Description
Term	E	1	String	The term about which the information is being provided
t-mnw	E	1	Float	The term's (specified by Term parameter) maximum normalized Term Frequency across all the documents. The document length should be considered, while calculating normalized Term Frequency, in order to get a normalized value for all the documents. This normalization is performed to prevent a bias towards longer documents (which may have a higher term count regardless of the actual importance of that term in the document). The normalization process will leads to a value between 0 to 1
Df	E	1	Int	Number of documents/records that contain this term in SE database/sub-database

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Table 43: Term-Info Structure

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8.2.10   Domain-Info Structure

Name	XML Type	Cardinality	Data Type	Description
SearchSub-Domain	E	1	String	The Search Sub-Domain about which the Domain Relevance is being provided. This element SHALL be same as the "Key" element in Dimensions structure of a Intra-Domain interest Model. This is to facilitate selecting the appropriate SE for particular user.
D-mnw	E	1	Float	The Search Sub-Domain's maximum normalized Domain Relevance across all the documents. The presence of related (belonging to the same Search Sub-Domain) terms in a particular document should be considered while calculating Domain Relevance for that document. Document length should also be considered, while calculating normalized Domain Relevance, in order to get a normalized value for all the documents. This normalization is performed to prevent a bias towards longer documents (which may have a higher term count regardless of the actual importance of that term in the document). The normalization process will leads to a value between 0 to 1
SSD-Doc-Num	E	0…1	Int	Number of documents belonging to the particular Search Sub-

				Domain.

Table 44: Domain-Info Structure

8.2.11   Trigger-Criteria Structure

Name	XML Type	Cardinality	Data Type	Description
Interval	E	1	Duration	The time interval between two set of pushed content. MSAS will generate search request periodically according to this Interval.

Table 45: Trigger-Criteria Structure

8.2.12   Status-code string

HTTP response code as defined in [RFC2616]

8.2.13   Answer structure

The format of an Answer SHALL be an Atom "entry" according to [RFC4287].

The following table shows the Atom representation of the elements of an Answer. In addition, this specification uses some of the GeoRSS elements and further defines new elements in Answer entries.

Unless indicated otherwise, the XML elements in the "Atom Representation" column are in the Atom namespace and defined in [RFC4287]. In particular, items containing the "geo:" prefix are defined in [GEORSS] specification.

Other Atom elements or any extension not indicated in this table MAY be included in the Answer to provide further information.

Note: This summary uses standard XPath notation: in particular, slashes show the element hierarchy, and an @ sign indicates an attribute of an element.

Entry Schema Item	Cardinality	Atom Representation	Description

Answer	1	`/feed/entry/summary`
		
		or
		
		`/feed/entry/content`
			Answer provided by an Expert
			See [RFC4287] for more details about requirements on this item

Expert-ID	0…N (as per [RFC4287])	`/feed/entry/author`	Details about the Expert(s) who provided the answer. See [RFC4287] for more details about requirements on this item.
Answer-ID	1 (as per [RFC4287])	`/feed/entry/id`	Identifier of the answer
Q&A Field	1	`/feed/entry/category/@term`	Q&A field of this answer

Location	0…1	`/feed/entry/georss:point`
		`(Simple)`
		
		or
		
		`/feed/entry/georss:where`
		`(GML)`
			Answer location

Answer Title	1 (as per [RFC4287])	`/feed/entry/title`	Title of the answer
Answer Last Update Date	1 (as per [RFC4287])	`/feed/entry/updated`	Identifies the date of the answer last update (or generation)
Url	0…N	`/feed/entry/link`	URL of the answer content and/or related content.

Table 46: Answer Atom representation

8.2.14 Selected-SE-list structure

Name	XML Type	Cardinality	Data Type	Description
SE-ID	A	1	String	The identification of the SE assigned to it at the time of registration.
SE-name	A	0…1	String	The name of the SE.

Table 47: Selected-SE-List structure

8.2.15 Recommendation Structure

Name	XML Type	Cardinality	Data Type	Description
Rating	E	1	Float	Contain the overall value of the rating
StatisticalInfo	E	0…1	Structure	Contain all the needed information about the way to calculate Recommendation (e.g. confidence level, algorithm, samples number, standard deviation, …)

Table 48: Recommendation structure

8.2.16 StatisticalInfo Structure

Name	XML Type	Cardinality	Data Type	Description
Algorithm	E	0…1	String	Name of the algorithm used to provide the recommendation.
ConfidenceLevel	E	0…1	Float	Indicate the reliability of the calculated rating.
Samples	E	0…1	Int	Total number of votes used to calculate the rating
StandardDeviation	E	0…1	Float	Indicate the accuracy of the calculated rating.

Table 49: Recommendation structure

8.2.17 Feedback Structure

Name	XML Type	Cardinality	Data Type	Description
Vote	E	0…1	Int	Contain the actual value of the vote expressed by the user about the result. The value SHALL be in the range from 0 to 100.
Comment	E	0…1	String	Contain a comment left by the user about the result
TagList	E	0…1	String	Contain a list of comma-separated tags inserted by the user about the result
Action	E	0…1	String	Specify user's action on the results. Some reserved strings are defined as value for this parameter as follows: • "Click": user clicked on the result • "Bookmark": user added the result as bookmark

Table 50: Feedback structure

8.2.18 SE Structure

Name	XML Type	Cardinality	Data Type	Description
Provider-ID	E	1	String	The ID assigned to the SE while registering. This Provider-ID is returned in the RegistrationResponse (Section 5.4.1.2)
SEName	E	1	String	Name of the SE
SEDescription	E	0…1	String	Short description about the SE.
Search-Domain	E	1…N	Structure	A structure containing information about the Search-Domain supported by the SE.

Table 51: SE Structure

8.2.19 Domain-Name reserved strings

Value	Description
Emergency	Emergency service e.g Medical

Real-Estate	Including housing, commercial
Music	Music search, download
Sports	Sports including different sports
Technology	Mobile handset, Software, Electronics items etc.
Jobs	Human Resources, jobs portal
Finance	Import and export,
Academics	Overseas education, universities/school search
Transportation	Transport including public transport, commercial transport
Yellow pages	Yellow pages including hotels, restaurants.
Community	Social network system information
Cultural	Cultural aspects e.g museum, monuments
Entertainment	Entertainment aspects e.g. concerts
News	News
Shopping	Shopping including e-shopping

Table 52: Domain-Name reserved strings

8.2.20   Domain-Mapping Structure

Domain-Mapping structure is a way to define mapping between domain-specific parameters extended by implementors with the ones used by SEs.

Name	XMLType	Cardinality	Data Type	Description
D-Parameter-Name	E	1	String	The name of the parameter used by MSS.
D-Parameter-Name-Mapping	E	1	String	The corresponding name for D-Parameter-Name used by SE.
D-Value-Script	E	0…1	String	A script function to map values between D-Parameter-Name and D-Parameter-Name-Mapping parameters. A script element has an optional 'type' attribute to indicate the language used.. Default value for type is "text/javascript"

Table 53: SE Structure

8.2.21   Questions Structure

Name	XML Type	Cardinality	Data Type	Description
Question	E	1	String	The string representing the real question being submitted
Question-ID	E	1	String	Refer to section 5.1

Table 54: Questions **structure**

8.3   Opensearch Extensions

The following extended URL parameters MAY be used in MSF Registration Descriptor "URL" element using [OpenSearch] or [PARA-EXT] formalism in addition to the ones already defined in [OpenSearch]. In addition, the "lat" and "lon" parameters of [OpenSearch-Geo] MAY be used to indicate the target location.

Note that the "oma:" and "oma-user:" prefixes are given as indication only and could differ in each implementation. However, the related namespace refer to this specification and MUST have the value "urn:oma:xml:msrch:messages:1.0" or "urn:oma:xml:msrch:userinfo:1.0" respectively.

Name	Type	Cardinality	Description
oma:Site	String	0…N	Different internet domain.
oma:Domain-Name	String	1	Search-Domain supported by SE.

oma:result-num	Int	1	Total number of result requested.
oma:Region	string	0…N	A string representation of a sub-division inside a country as specified in [ISO 3166]. This indicates the target region to be considered, alternative to the current user location.
oma:resultsType	String	0…N	Indicates the type of content that the user want for his search or subscription (e.g. video, picture, text, …)
oma:ratingThreshold	Int	0…1	Indicate the threshold of rating that the results must pass.
oma:contentFilter	String	0…1	Indicates the level of search results filtering desired based upon sensitivity of search user to the potential results. Possible values are: "none", "moderate" and "strict". The MSF provider is responsible for the association of these filtering levels to specific criteria, e.g. as those criteria may vary by region.
oma:Tags	String	0…1	Comma-separated list of tags related to the search
oma:Content	Base64	0…1	Binary content submitted as search input
oma:Content-URL	String	0…1	URL of the file submitted as search input
oma:Selected-SE-List	Structure	0…1	The identification of the SE(s) selected. This parameter SHALL NOT be used by SEs when registering.
oma:MSS-ID	String	0..1	See the description in section 5.1
oma:Request-ID	String	0..1	A unique identifier of a request.
oma-user:userGender	enumeration	0…1	User gender. SE may use this parameter to require user gender information. Reserved keywords are: -M: Male; -F: Female.
oma-user:userAge	int	0…1	User age. SE may use this parameter to require user age information.
oma-user:maritalStatus	enumeration	0…1	User marital status. SE may use this parameter to require user marital status information. Reserved keywords are: - M: Married - S: Single - D: Divorced - W: Widowed - P: Separated - DP: Domestic Partner (has benefits similar to M).
oma-user:userIM	Structure	0…1	User Interest Model.
oma-user:userLat	Float	0…1	User current location in terms of latitude
oma-user:userLon	Float	0…1	User current location in terms of longitude

Table 55: MSF OpenSearch-specific parameter extensions

Appendix A. Change History (Informative)

A.1 Approved Version History

Reference	Date	Description
Approved Version OMA-TS-MSrchFramework-V1_0	31 Jul 2012	Status changed to Approved by TP: TP ref#: OMA-TP-2012-0292- INP_MSrchFramework_V1_0_ERP_for_Final_Approval

Appendix B.   Static Conformance Requirements   (Normative)

The notation used in this appendix is specified in [SCRRULES].

B.1   SCR for MSF-Client

Item	Function	Reference	Requirement
MSF-REQ-C-001-M	Search request delivery over MSF-1	Section 6.1.3	
MSF-SUB-C-002-M	Subscription request delivery over MSF-1.	Section 6.1.2	
MSF-QA-C-003-M	Question request delivery over MSF-1.	Section 6.1.1	
MSF-FB-C-004-M	Feedback request delivery over MSF-1.	Section 6.1.5	
MSF-QC-C-004-M	QueryCapabilities request delivery over MSF-1.	Section 6.1.6	
MSF-NP-C-004-M	NextPage request delivery over MSF-1.	Section 6.1.4	

B.2   SCR for MSAS

Item	Function	Reference	Requirement
MSF-REQ-S-001-M	Forwarding search request to MSS over MSF-2	Section 6.2.2	
MSF-DOM-S-002-M	Providing Search Domain to a search request	Section 6.2.2	
MSF-UIM-S-003-O	Generating User Interest Model.	Section 6.2.2, 8.1.2	
MSF-UIM-S-004	Forwarding UIM to MSS in the search request over MSF-2.	5.2.1, 6.2.2, 8.1.2	
MSF-SUB-S-004-M	Generating search request towards MSS against a subscription request over MSF-2	6.2.6	
MSF-QA-S-005-M	Forwarding question request to MSS over MSF-2	6.2.3	
MSF-QA-S-006-M	Providing QA-Field to a question request	6.2.3	

B.3   SCR for MSS

Item	Function	Reference	Requirement
MSF-SEL-001-M	Selecting appropriate SE for a given search request.	6.3.1, C.1	
MSF-SEL-002-M	Dispatching search request to selected SE over MSF-4.	6.3.1, 5.4.1.1	
MSF-SEL-003-M	Sending User Interest Model to SE with the search request over MSF-4	6.3.1, 5.4.1.1	
MSF-PER-004-M	Consolidating the search results from different SE and removing redundancy.	6.3.3	
MSF-PER-005-M	Re-rank the consolidated list according the Search Domain/Search sub-domain preference of user.	6.3.3	
MSF-MET-006-M	Exchanging Meta-Index of the registered SE during MSS registration.	5.3	
MSF-MET-006-M	Updating Meta-Index previously submitted during MSS registration.	5.3	
MSF-REG-007-M	Exposing MSF-3 for SEs to get registered.	5.3	

Item	Function	Reference	Requirement
MSF-REG-008-M	Allowing SEs to submit their Meta-Index, using MSF-3, while registration.	5.3	

B.4   SCR for SE

Item	Function	Reference	Requirement
SE-PER-001-M	Using UIM to rank and sort the result list produced.	6.4.2	

Appendix C.   SE Selection Guidelines (Informative)

This section provides guidelines for SE selection based on different criteria.

C.1   SE Selection based on similarity between query and Meta-Index

The main idea behind SE selection based on query and Meta-Index is to find the SE having the most similar document/record with the query itself. More precisely, a SE having the maximum normalized occurrences of query terms across its documents. The SE's individual Meta-Index should serve as a source for term-document statistics (e.g. what term is appearing how many times in the SE's documents).

To achieve appropriate SE selection, all SE's can be ranked according to their important. The SE with the highest rank will them be selected. The following formula can be used to rank a particular SE based on the similarity between query and Meta-Index.

$$Msim1 = Max1 <= i <= n\{qi*gidfi*t\text{-}mnwi\}$$

Where,

qi is the importance of the ith term (of the query) with in the query itself.

t-mnwi is the maximum normalized Term Frequency of ith term (of the query) across all the SE's document. This value is expected to be provided by SE in their respective Meta-Index while registration.

gidfi is inverse of the number of documents actually containing the ith term in the SE database. The inverse is considered to avoid incorrectly emphasizing long documents which happen to use the word like "the" more, without giving enough weight to the more meaningful terms "president" and "india".

The SE's ranked highest (maximum Msim1) will be selected.

C.2   SE Selection based on similarity between query, Meta-Index and User Interest Model.

In addition to the similarity between query and Meta-Index, user preference in Search Domain/Search Sub-Domain (which can be known by Inter-Domain and Intra-Domain interest model) may also be considered while SE selection. This selection method will screen SE based on which SE has the most relevant document pertaining to the Search Sub-Domain preferred by user. The SE's individual Meta-Index should serve as a source for document and Search Sub-Domain statistics (e.g. how well the documents are relevant to a particular Search Sub-Domain preferred by user, in SE's database).

The following formula can be used to rank SE based on the relevance between query, Meta-Index and User Interest Model.

$$Msim2 = Max_{1<=i<=n}\{r_i * Di\text{-}mnw_i\} + Msim1$$

Where,
- r_i is the importance of a particular Search Sub-domain in the Intra-Domain Interest Model. This UIM can be long-term (GENERAL) or instant (SESSION-BASED) or a weighted sum of both.
- Di-mnw is the Search Sub-Domain's maximum normalized Domain Relevance across all the documents. This value is expected to be provided by SE in their respective Meta-Index while registration.
- Msim1 is the SE rank based on query and Meta-Index.

The SE's ranked highest (maximum Msim2) will be selected.

Appendix D. User Interest Model (Informative)

User Interest Model (User-im), as list of dimensions, may be implemented as an array or structure (XML).

D.1 UIM as XML complex type

The following is an example of XSD file for UIM according to section 8.2.2 specification.

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:element name= "User-im">
<xs:complexType>
                <xs:sequence maxOccurs="unbounded">
                <xs:element name="Dimensions" type="xs:dim" maxOccurs="unbounded"/>
                </xs:sequence>
</xs:complexType>
<xs:attribute name="Domain-Name" type="xs:string"/>
</xs:element>
<xs:complexType name="dim">
<xs:sequence>
                <xs:element name="Key" type="xs:string" minOccurs="0" maxOccurs="1"/>
                <xs:element name="Value" type="xs:float" minOccurs="1" maxOccurs="1"/>
                <xs:attribute name="Type" type="xs:enumeration" minOccurs="1" maxOccurs="1"/>
                <xs:any namespace="##other" processContents="lax" minOccurs="0"
maxOccurs="unbounded"/>
</xs:sequence>
</xs:complexType>
```

The following is the example of an Intra-Domain interest model (for Real State Search Domain) using the above XML schema.

```
<?xml version="1.0" encoding="UTF-8"?>
<User-im SD="Real Estate">
<dimension>
                <key>New</key>
                <value type=" SESSION-BASED">0.65</value>
                <value type="GENERAL">0.2</value>
</dimensions>
<dimension>
                <key>Old</key>
                <value type=" SESSION-BASED">0.30</value>
                <value type="GENERAL">0.2</value>
</dimensions>
<dimension>
                <key>one_room</key>
                <value type=" SESSION-BASED">0.35</value>
<value type="GENERAL">0.1</value>
</dimensions>
</User-im>
```

D.2 UIM as array

UIM = (D1, D2, Di ....Dn)

Di indicates user's interest in *i*th Search Domain. The relation between the element (of array) and the Search Domain can be achieved by relating particular Search Domain with a particular sequence number of element.

Appendix E.   Examples   (Informative)

E.1   Search examples

E.1.1   Search Request

The following is an example of a Search Request over MSF-1 formatted according to this specification.

```
POST <MSAS_URL> HTTP/1.1
Content-Type: multipart/form-data; boundary=AaB03x
Content-Length: ...

--AaB03x
Content-Disposition: form-data; name="message"

SearchRequest
--AaB03x
Content-Disposition: form-data; name="text"

My first search on OMA MSF
--AaB03x
Content-Disposition: form-data; name="tags"

search,oma,msf
--AaB03x
Content-Disposition: form-data; name="domain-name"

blog
--AaB03x
Content-Disposition: form-data; name="client-id"

<CLIENT_ID>
--AaB03x--
```

E.1.2   Search response

The following is an example of a Search Response feed formatted according to this specification.

```
<?xml version="1.0" encoding="UTF-8"?>
<feed xmlns ="http://www.w3.org/2005/Atom"
       xmlns:openSearch="http://a9.com/-/spec/opensearch/1.1/"
       xmlns:oma="urn:oma:xml:msrch:messages:1.0" >
  <id>http://www.example.com/feed/1234.1/posts/full</id>
  <updated>2005-09-16T00:42:06Z</updated>
  <title>Example MSF results</title>
  <author>
    <name>Example MSAS</name>
    <uri>http://msas.example.com</uri>
  </author>
  <openSearch:totalResults>2</openSearch:totalResults>
  <openSearch:startIndex>0</openSearch:startIndex>
  <entry>
    <id>http://www.example.com/feed/1234.1/posts/full/4521614025009481151</id>
    <updated>2005-01-09T08:00:00Z</updated>
    <category term="blog.post"/>
    <title type="text">This is the title of entry 1009</title>
    <content type="xhtml">
      <div
        xmlns="http://www.w3.org/1999/xhtml">This is the entry body of entry 1009</div>
    </content>
    <link rel="alternate" type="text/html"
      href="http://www.example.com/posturl"/>
```

```
    <author>
      <name>SE 1</name>
      <uri>http://www1.example.com</uri>
    </author>
    <oma:persScore>0.413</oma:persScore>
  </entry>
  <entry>
    <id>http://www.example.com/feed/1234.1/posts/full/3067545004648931569</id>
    <published>2005-01-07T08:00:00Z</published>
    <updated>2005-01-07T08:02:00Z</updated>
    <category term="blog.post"/>
    <title type="text">This is the title of entry 1007</title>
    <content type="xhtml">
      <div
        xmlns="http://www.w3.org/1999/xhtml">This is the entry body of entry 1007</div>
    </content>
    <link rel="alternate" type="text/html"
      href="http://www.example.com/posturl"/>
    <author>
      <name>SE 2</name>
      <uri>http://www2.example.com</uri>
    </author>
    <georss:point>45.256 -71.92</georss:point>
    <oma:persScore>0.362</oma:persScore>
  </entry>
</feed>
```

E.2   Q&A Examples

E.2.1   Q&A request

The following is an example of a QARequest over MSF-1 formatted according to this specification.

```
POST <MSAS_URL> HTTP/1.1
Content-Type: multipart/form-data; boundary=AaB03x
Content-Length: ...

--AaB03x
Content-Disposition: form-data; name="message"

QARequest
--AaB03x
Content-Disposition: form-data; name="question"

How-to implement OMA MSF?
--AaB03x
Content-Disposition: form-data; name="qa-field"

technology
--AaB03x
Content-Disposition: form-data; name="client-id"

<CLIENT_ID>
--AaB03x--
```

E.2.2   Q&A response

The following is an example of a QA Response feed formatted according to this specification.

```
<?xml version="1.0" encoding="UTF-8"?>
<feed xmlns ="http://www.w3.org/2005/Atom"
      xmlns:openSearch="http://a9.com/-/spec/opensearch/1.1/"
      xmlns:oma="urn:oma:xml:msrch:messages:1.0" >
```

```
    <id>http://www.example.com/feed/1234.1/answers/full</id>
    <updated>2005-09-16T00:42:06Z</updated>
    <title>Example QA answers</title>
    <author>
      <name>QA MSAS</name>
      <uri>http://msas.example.com</uri>
    </author>
    <openSearch:totalResults>2</openSearch:totalResults>
    <openSearch:startIndex>0</openSearch:startIndex>
    <entry>
      <id>http://www.example.com/feed/1234.1/answers/full/4521614025009481151</id>
      <updated>2005-01-09T08:00:00Z</updated>
      <category term="technology.standard"/>
      <title type="text">This is easy stuff</title>
      <content type="xhtml">
        <div
          xmlns="http://www.w3.org/1999/xhtml">This is very easy to implement</div>
      </content>
      <link rel="alternate" type="text/html"
        href="http://www.example.com/answerurl"/>
      <author>
        <name>Expert A</name>
      </author>
    </entry>
    <entry>
      <id>http://www.example.com/feed/1234.1/answers/full/3067545004648931569</id>
      <published>2005-01-07T08:00:00Z</published>
      <updated>2005-01-07T08:02:00Z</updated>
      <category term="technology.standard"/>
      <title type="text">Forget about it</title>
      <content type="xhtml">
        <div
          xmlns="http://www.w3.org/1999/xhtml">You should forget about implementing it</div>
      </content>
      <link rel="alternate" type="text/html"
        href="http://www.example.com/answerurl"/>
      <author>
        <name>Expert B</name>
      </author>
      <georss:point>45.256 -71.92</georss:point>
    </entry>
</feed>
```

E.3   Registration Request

The following is the example of a Registration Request from a SE

```
POST <MSS_URL> HTTP/1.1
Content-Type: application/xml

Content-Length: ...

<?xml version="1.0" encoding="UTF-8"?>
<OpenSearchDescription xmlns="http://a9.com/-/spec/opensearch/1.1/"
xmlns:par="http://a9.com/-spec/opensearch/extensions/parameters/1.0/"
xmlns:oma="urn:oma:xml:msrch:messages:1.0"
xmlns:oma-user="urn:oma:xml:msrch:userinfo:1.0"
xmlns:geo="http://a9.com/-/opensearch/extensions/geo/1.0/">
<ShortName>Web Search</ShortName>
<Description>Use Example.com to search the Web.</Description>
<Url
    type="application/atom+xml"
```

```
   template="http://example.com/search?q={searchTerms}&count={itemsPerPage}&lat={geo:lat?}&lo
n={geo:lon?}&uAge={oma-user:userAge?}&uGender={oma-user:userGender?}&umStatus={oma-
user:maritalStatus?}"
   par:method="POST"
   par:enctype="application/multipart/form-data">
   <par:Parameter name="userim" value="{oma-user:userIM}" minimum="0"/>
   <par:Parameter name="domainName" value="{oma:Domain-Name}" minimum="0"/>
   <par:Parameter name="resultType" value="{oma:resultType}" minimum="0"/>
   <par:Parameter name="language" value="{oma:language}" minimum="0"/>
   <par:Parameter name="Result-num" value="{oma:result-num}" minimum="0"/>
</Url>
<LongName>Example.com Web Search</LongName>
<Image height="16" width="16"
type="image/vnd.microsoft.icon">http://example.com/websearch.ico</Image>
<oma:SE>
   <oma:Provider-ID>1</oma:Provider-ID>
   <oma:SEName>Web Search</oma:SEName>
   <oma:SEDescription>Use Example.com to search the Web.</oma:SEDescription>
   <oma:Search-Domain>
       <oma:Domain-Name>Real-Estate</oma:Domain-Name>
       <oma:Doc-num>200</oma:Doc-num>
       <oma:Sub-Domain>House – 1BDR</oma:Sub-Domain>
       <oma:Sub-Domain>House – 2BDR</oma:Sub-Domain>
       <oma:Domain-Mapping>
                   <oma:D-Parameter-Name>price</oma:D-Parameter-Name>
                   <!--SE understands 'price' as 'p' -->
                   <oma:D-Parameter-Name-Mapping>p</oma:D-Parameter-Name-Mapping>
                   <!--SE uses Chinese RMB as price unit. 1USD=6.8RMB -->
                   <oma:D-Value-Script type="text/javascript">return price*6.8</oma:D-Value-
Script>
       </oma:Domain-Mapping>
       <oma:Domain-Mapping>
                   <oma:D-Parameter-Name>room_type</oma:D-Parameter-Name>
                   <!--SE understands 'room type' as 'rt' -->
                   <oma:D-Parameter-Name-Mapping>rt</oma:D-Parameter-Name-Mapping>
                   <!-- Enum is used for 'room type'. MSS's Enum value '1' corresponds to
SE's Enum value '0'-->
                   <oma:D-Value-Script type="text/javascript">if (room_type == "1") return
"0" else if (room_type == "2") return "1" else return "2"</oma:D-Value-Script>
       </oma:Domain-Mapping>
       <oma:Region>CN-11</oma:Region>
   </oma:Search-Domain>
</oma:SE>
</OpenSearchDescription>
```