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IMAP4 Multimapbox SEARCH Extension

Abstract

The IMAP4 specification allows the searching of only the selected mailbox. A user often wants to search multiple mailboxes, and a client that wishes to support this must issue a series of SELECT and SEARCH commands, waiting for each to complete before moving on to the next. This extension allows a client to search multiple mailboxes with one command, limiting the round trips and waiting for various searches to complete, and not requiring disruption of the currently selected mailbox. This extension also uses MAILBOX and TAG fields in ESEARCH responses, allowing a client to pipeline the searches if it chooses. This document updates RFC 4466.

Status of This Memo

This document is not an Internet Standards Track specification; it is published for examination, experimental implementation, and evaluation.

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1. Introduction

The IMAP4 specification allows the searching of only the selected mailbox. A user often wants to search multiple mailboxes, and a client that wishes to support this must issue a series of SELECT and SEARCH commands, waiting for each to complete before moving on to the next. The commands can't be pipelined, because the server might run them in parallel, and the untagged SEARCH responses could not then be distinguished from each other.

This extension allows a client to search multiple mailboxes with one command, and includes MAILBOX and TAG fields in the ESEARCH response, yielding the following advantages:

- o A single command limits the number of round trips needed to search a set of mailboxes.
- o A single command eliminates the need to wait for one search to complete before starting the next.

- o A single command allows the server to optimize the search, if it can.
- o A command that is not dependent upon the selected mailbox eliminates the need to disrupt the selection state or to open another IMAP connection.
- o The MAILBOX, UIDVALIDITY, and TAG fields in the responses allow a client to distinguish which responses go with which search (and which mailbox). A client can safely pipeline these search commands without danger of confusion. The addition of the MAILBOX and UIDVALIDITY fields updates the search-correlator item defined in [RFC4466].

1.1. Conventions Used in This Document

In examples, "C:" indicates lines sent by a client that is connected to a server. "S:" indicates lines sent by the server to the client.

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 RFC 2119 [RFC2119].

2. New ESEARCH Command

Arguments: OPTIONAL source options
 OPTIONAL result options
 OPTIONAL charset specification (see [RFC2978])
 searching criteria (one or more)

Responses: REQUIRED untagged response: ESEARCH

Result: OK -- search completed
 NO -- error: cannot search that charset or criteria
 BAD -- command unknown or arguments invalid

This section defines a new ESEARCH command, which works similarly to the UID SEARCH command described in Section 2.6.1 of [RFC4466] (initially described in Section 6.4.4 of [RFC3501] and extended by [RFC4731]).

The ESEARCH command further extends searching by allowing for optional source and result options. This document does not define any new result options (see Section 3.1 of [RFC4731]). A server that supports this extension includes "MULTISEARCH" in its IMAP capability string.

Because there has been confusion about this, it is worth pointing out that with ESEARCH, as with **any** SEARCH or UID SEARCH command, it **MUST NOT** be considered an error if the search terms include a range of message numbers that extends (or, in fact, starts) beyond the end of the mailbox. For example, a client might want to establish a rolling window through the search results this way:

C: tag1 UID ESEARCH FROM "frobozz" 1:100

...followed later by this:

C: tag1 UID ESEARCH FROM "frobozz" 101:200

...and so on. This tells the server to match only the first hundred messages in the mailbox the first time, the second hundred the second time, etc. In fact, it might likely allow the server to optimize the search significantly. In the above example, whether the mailbox contains 50 or 150 or 250 messages, neither of the search commands shown will result in an error. It is up to the client to know when to stop moving its search window.

2.1. The ESEARCH Response

In response to an ESEARCH command, the server **MUST** return ESEARCH responses [RFC4731] (that is, not SEARCH responses). Because message numbers are not useful for mailboxes that are not selected, the responses **MUST** contain information about UIDs, not message numbers. This is true even if the source options specify that only the selected mailbox be searched.

Presence of a source option in the absence of a result option implies the "ALL" result option (see Section 3.1 of [RFC4731]). Note that this is not the same as the result from the SEARCH command described in the IMAP base protocol [RFC3501].

Source options describe which mailboxes must be searched for messages. An ESEARCH command with source options does not affect which mailbox, if any, is currently selected, regardless of which mailboxes are searched.

For each mailbox satisfying the source options, a single ESEARCH response **MUST** be returned if any messages in that mailbox match the search criteria. An ESEARCH response **MUST NOT** be returned for mailboxes that contain no matching messages. This is true even when result options such as MIN, MAX, and COUNT are specified (see Section 3.1 of [RFC4731]), and the values returned (lowest UID matched, highest UID matched, and number of messages matched, respectively) apply to the mailbox reported in that ESEARCH response.

Note that it is possible for an ESEARCH command to return **no** untagged responses (no ESEARCH responses at all), in the case that there are no matches to the search in any of the mailboxes that satisfy the source options. Clients can detect this situation by finding the tagged OK response without having received any matching untagged ESEARCH responses.

Each ESEARCH response MUST contain the MAILBOX, TAG, and UIDVALIDITY correlators. Correlators allow clients to issue several ESEARCH commands at once (pipelined). If the SEARCHRES [RFC5182] extension is used in an ESEARCH command, that ESEARCH command MUST be executed by the server after all previous SEARCH/ESEARCH commands have completed and before any subsequent SEARCH/ESEARCH commands are executed. The server MAY perform consecutive ESEARCH commands in parallel as long as none of them use the SEARCHRES extension.

2.2. Source Options: Specifying Mailboxes to Search

The source options, if present, MUST contain a mailbox specifier as defined in the IMAP NOTIFY extension [RFC5465], Section 6 (using the "filter-mailboxes" ABNF item), with the following differences:

1. The "selected-delayed" specifier is not valid here.
2. A "subtree-one" specifier is added. The "subtree" specifier results in a search of the specified mailbox and all selectable mailboxes that are subordinate to it, through an indefinitely deep hierarchy. The "subtree-one" specifier results in a search of the specified mailbox and all selectable child mailboxes, one hierarchy level down.

If "subtree" is specified, the server MUST defend against loops in the hierarchy (for example, those caused by recursive file-system links within the message store). The server SHOULD do this by keeping track of the mailboxes that have been searched, and terminating the hierarchy traversal when a repeat is found. If it cannot do that, it MAY do it by limiting the hierarchy depth.

If the source options are not present, the value "selected" is assumed -- that is, only the currently selected mailbox is searched.

The "personal" source option is a particularly convenient way to search all of the current user's mailboxes. Note that there is no way to use wildcard characters to search all mailboxes; the "mailboxes" source option does not do wildcard expansion.

If the source options include (or default to) "selected", the IMAP session MUST be in "selected" state. If the source options specify other mailboxes and NOT "selected", then the IMAP session MUST be in either "selected" or "authenticated" state. If the session is not in a correct state, the ESEARCH command MUST return a "BAD" result.

If the server supports the SEARCHRES [RFC5182] extension, then the "SAVE" result option is valid *only* if "selected" is specified or defaulted as the sole mailbox to be searched. If any source option other than "selected" is specified, the ESEARCH command MUST return a "BAD" result.

If the server supports the CONTEXT=SEARCH and/or CONTEXT=SORT extension [RFC5267], then the following additional rules apply:

- o The CONTEXT return option (Section 4.2 of [RFC5267]) can be used with an ESEARCH command.
- o If the UPDATE return option is used (Section 4.3 of [RFC5267]), it MUST apply *ONLY* to the currently selected mailbox. If UPDATE is used and there is no mailbox currently selected, the ESEARCH command MUST return a "BAD" result.
- o The PARTIAL search return option (Section 4.4 of [RFC5267]) can be used and applies to each mailbox searched by the ESEARCH command.

If the server supports the Access Control List (ACL) [RFC4314] extension, then the logged-in user is required to have the "r" right for each mailbox she wants to search. In addition, any mailboxes that are not explicitly named (accessed through "personal" or "subtree", for example) are required to have the "l" right. Mailboxes matching the source options for which the logged-in user lacks sufficient rights MUST be ignored by the ESEARCH command processing. In particular, ESEARCH responses MUST NOT be returned for those mailboxes.

3. Examples

In the following example, note that two ESEARCH commands are pipelined, and that the server is running them in parallel, interleaving a response to the second search amid the responses to the first (watch the tags).

```
C: tag1 ESEARCH IN (mailboxes "folder1" subtree "folder2") unseen
C: tag2 ESEARCH IN (mailboxes "folder1" subtree-one "folder2")
subject "chad"
S: * ESEARCH (TAG "tag1" MAILBOX "folder1" UIDVALIDITY 1) UID ALL
4001,4003,4005,4007,4009
```

```
S: * ESEARCH (TAG "tag2" MAILBOX "folder1" UIDVALIDITY 1) UID ALL
3001:3004,3788
S: * ESEARCH (TAG "tag1" MAILBOX "folder2/banana" UIDVALIDITY 503)
UID ALL 3002,4004
S: * ESEARCH (TAG "tag1" MAILBOX "folder2/peach" UIDVALIDITY 3) UID
ALL 921691
S: tag1 OK done
S: * ESEARCH (TAG "tag2" MAILBOX "folder2/salmon" UIDVALIDITY
1111111) UID ALL 50003,50006,50009,50012
S: tag2 OK done
```

4. Formal Syntax

The following syntax specification uses the Augmented Backus-Naur Form (ABNF) as described in [RFC5234]. Terms not defined here are taken from [RFC3501], [RFC5465], or [RFC4466].

```
command-auth =/  esearch
                ; Update definition from IMAP base [RFC3501].
                ; Add new "esearch" command.
```

```
command-select =/  esearch
                  ; Update definition from IMAP base [RFC3501].
                  ; Add new "esearch" command.
```

```
filter-mailboxes-other =/  ("subtree-one" SP one-or-more-mailbox)
                          ; Update definition from IMAP Notify [RFC5465].
                          ; Add new "subtree-one" selector.
```

```
filter-mailboxes-selected =  "selected"
                          ; Update definition from IMAP Notify [RFC5465].
                          ; We forbid the use of "selected-delayed".
```

```
one-correlator =  ("TAG" SP tag-string) / ("MAILBOX" SP astring) /
                  ("UIDVALIDITY" SP nz-number)
                  ; Each correlator MUST appear exactly once.
```

```
scope-option =  scope-option-name [SP scope-option-value]
                ; No options defined here. Syntax for future extensions.
```

```
scope-option-name =  tagged-ext-label
                    ; No options defined here. Syntax for future extensions.
```

```
scope-option-value =  tagged-ext-val
                    ; No options defined here. Syntax for future extensions.
```

```
scope-options = scope-option *(SP scope-option)
                ; A given option may only appear once.
                ; No options defined here. Syntax for future extensions.

esearch = "ESEARCH" [SP esearch-source-opts]
          [SP search-return-opts] SP search-program

search-correlator = SP "(" one-correlator *(SP one-correlator) ")"
                  ; Updates definition in IMAP4 ABNF [RFC4466].

esearch-source-opts = "IN" SP "(" source-mbox [SP
                  "(" scope-options ")"] ")"

source-mbox = filter-mailboxes *(SP filter-mailboxes)
              ; "filter-mailboxes" is defined in IMAP Notify [RFC5465].
              ; See updated definition of filter-mailboxes-other, above.
              ; See updated definition of filter-mailboxes-selected, above.
```

5. Security Considerations

This new IMAP ESEARCH command allows a single command to search many mailboxes at once. On the one hand, a client could do that by sending many IMAP SEARCH commands. On the other hand, this makes it easier for a client to overwork a server, by sending a single command that results in an expensive search of tens of thousands of mailboxes. Server implementations need to be aware of that, and provide mechanisms that prevent a client from adversely affecting other users. Limitations on the number of mailboxes that may be searched in one command, and/or on the server resources that will be devoted to responding to a single client, are reasonable limitations for an implementation to impose.

Implementations **MUST**, of course, apply access controls appropriately, limiting a user's access to ESEARCH in the same way its access is limited for any other IMAP commands. This extension has no data-access risks beyond what may be there in the unextended IMAP implementation.

Mailboxes matching the source options for which the logged-in user lacks sufficient rights **MUST** be ignored by the ESEARCH command processing (see the paragraph about this in Section 2.2). In particular, any attempt to distinguish insufficient access from non-existent mailboxes may expose information about the mailbox hierarchy that isn't otherwise available to the client.

If "subtree" is specified, the server **MUST** defend against loops in the hierarchy (see the paragraph about this in Section 2.2).

6. IANA Considerations

IMAP4 capabilities are registered by publishing a Standards Track or IESG-approved Experimental RFC. The "IMAP 4 Capabilities" registry is currently located here:

<http://www.iana.org/>

This document defines the IMAP capability "MULTISEARCH", and IANA has added it to the registry.

7. Acknowledgements

The authors gratefully acknowledge feedback provided by Timo Sirainen, Peter Coates, and Arnt Gulbrandsen.

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