

Network Working Group  
Request for Comments: 4731  
Category: Standards Track

A. Melnikov  
Isode Ltd  
D. Cridland  
Inventure Systems Ltd  
November 2006

## IMAP4 Extension to SEARCH Command for Controlling What Kind of Information Is Returned

### Status of This Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

### Copyright Notice

Copyright (C) The IETF Trust (2006).

### Abstract

This document extends IMAP (RFC 3501) SEARCH and UID SEARCH commands with several result options, which can control what kind of information is returned. The following result options are defined: minimal value, maximal value, all found messages, and number of found messages.

### Table of Contents

1. Introduction .....	2
2. Conventions Used in This Document .....	2
3. IMAP Protocol Changes .....	2
3.1. New SEARCH/UID SEARCH Result Options .....	2
3.2. Interaction with CONDSTORE extension .....	4
4. Formal Syntax .....	5
5. Security Considerations .....	6
6. IANA Considerations .....	6
7. Normative References .....	6
8. Acknowledgments .....	6

## 1. Introduction

[IMAPABNF] extended SEARCH and UID SEARCH commands with result specifiers (also known as result options), which can control what kind of information is returned.

A server advertising the ESEARCH capability supports the following result options: minimal value, maximal value, all found messages, and number of found messages. These result options allow clients to get SEARCH results in more convenient forms, while also saving bandwidth required to transport the results, for example, by finding the first unseen message or returning the number of unseen or deleted messages. Also, when a single MIN or a single MAX result option is specified, servers can optimize execution of SEARCHes.

## 2. Conventions Used in This Document

In examples, "C:" and "S:" indicate lines sent by the client and server, respectively.

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 [KEYWORDS].

## 3. IMAP Protocol Changes

### 3.1. New SEARCH/UID SEARCH Result Options

The SEARCH/UID SEARCH commands are extended to allow for the following result options:

#### MIN

Return the lowest message number/UID that satisfies the SEARCH criteria.

If the SEARCH results in no matches, the server MUST NOT include the MIN result option in the ESEARCH response; however, it still MUST send the ESEARCH response.

#### MAX

Return the highest message number/UID that satisfies the SEARCH criteria.

If the SEARCH results in no matches, the server MUST NOT include the MAX result option in the ESEARCH response; however, it still MUST send the ESEARCH response.

**ALL**

Return all message numbers/UIDs that satisfy the SEARCH criteria. Unlike regular (unextended) SEARCH, the messages are always returned using the sequence-set syntax. A sequence-set representation may be more compact and can be used as is in a subsequent command that accepts sequence-set. Note, the client MUST NOT assume that messages/UIDs will be listed in any particular order.

If the SEARCH results in no matches, the server MUST NOT include the ALL result option in the ESEARCH response; however, it still MUST send the ESEARCH response.

**COUNT**

Return number of the messages that satisfy the SEARCH criteria. This result option MUST always be included in the ESEARCH response.

If one or more result options described above are specified, the extended SEARCH command MUST return a single ESEARCH response [IMAPABNF], instead of the SEARCH response.

An extended UID SEARCH command MUST cause an ESEARCH response with the UID indicator present.

Note that future extensions to this document can allow servers to return multiple ESEARCH responses for a single extended SEARCH command. These extensions will have to describe how results from multiple ESEARCH responses are to be amalgamated.

If the list of result options is empty, that requests the server to return an ESEARCH response instead of the SEARCH response. This is equivalent to "(ALL)".

Example: C: A282 SEARCH RETURN (MIN COUNT) FLAGGED  
SINCE 1-Feb-1994 NOT FROM "Smith"  
S: \* ESEARCH (TAG "A282") MIN 2 COUNT 3  
S: A282 OK SEARCH completed

Example: C: A283 SEARCH RETURN ( ) FLAGGED  
SINCE 1-Feb-1994 NOT FROM "Smith"  
S: \* ESEARCH (TAG "A283") ALL 2,10:11  
S: A283 OK SEARCH completed

The following example demonstrates finding the first unseen message as returned in the UNSEEN response code on a successful SELECT command:

```
Example:  C: A284 SEARCH RETURN (MIN) UNSEEN
          S: * ESEARCH (TAG "A284") MIN 4
          S: A284 OK SEARCH completed
```

The following example demonstrates that if the ESEARCH UID indicator is present, all data in the ESEARCH response is referring to UIDs; for example, the MIN result specifier will be followed by a UID.

```
Example:  C: A285 UID SEARCH RETURN (MIN MAX) 1:5000
          S: * ESEARCH (TAG "A285") UID MIN 7 MAX 3800
          S: A285 OK SEARCH completed
```

The following example demonstrates returning the number of deleted messages:

```
Example:  C: A286 SEARCH RETURN (COUNT) DELETED
          S: * ESEARCH (TAG "A286") COUNT 15
          S: A286 OK SEARCH completed
```

### 3.2. Interaction with CONDSTORE extension

When the server supports both the ESEARCH and the CONDSTORE [CONDSTORE] extension, and the client requests one or more result option described in section 3.1 together with the MODSEQ search criterion in the same SEARCH/UID SEARCH command, then the server MUST return the ESEARCH response containing the MODSEQ result option (described in the following paragraph) instead of the extended SEARCH response described in section 3.5 of [CONDSTORE].

If the SEARCH/UID SEARCH command contained a single MIN or MAX result option, the MODSEQ result option contains the mod-sequence for the found message. If the SEARCH/UID SEARCH command contained both MIN and MAX result options and no ALL/COUNT option, the MODSEQ result option contains the highest mod-sequence for the two returned messages. Otherwise the MODSEQ result option contains the highest mod-sequence for all messages being returned.

Example: The following example demonstrates how Example 15 from [CONDSTORE] would look in the presence of one or more result option:

```
C: a1 SEARCH RETURN (MIN) MODSEQ "/flags/\\draft"
    all 620162338
S: * ESEARCH (TAG "a1") MIN 2 MODSEQ 917162488
S: a1 OK Search complete

C: a2 SEARCH RETURN (MAX) MODSEQ "/flags/\\draft"
    all 620162338
S: * ESEARCH (TAG "a2") MAX 23 MODSEQ 907162321
```

```

S: a2 OK Search complete

C: a3 SEARCH RETURN (MIN MAX) MODSEQ "/flags/\\draft"
    all 620162338
S: * ESEARCH (TAG "a3") MIN 2 MAX 23 MODSEQ 917162488
S: a3 OK Search complete

C: a4 SEARCH RETURN (MIN COUNT) MODSEQ "/flags/\\draft"
    all 620162338
S: * ESEARCH (TAG "a4") MIN 2 COUNT 10 MODSEQ 917162500
S: a4 OK Search complete

```

#### 4. Formal Syntax

The following syntax specification uses the Augmented Backus-Naur Form (ABNF) notation as specified in [ABNF].

Non-terminals referenced but not defined below are as defined by [IMAP4], [CONDSTORE], or [IMAPABNF].

Except as noted otherwise, all alphabetic characters are case-insensitive. The use of upper or lowercase characters to define token strings is for editorial clarity only. Implementations MUST accept these strings in a case-insensitive fashion.

```

capability          =/ "ESEARCH"

search-return-data  = "MIN" SP nz-number /
                     "MAX" SP nz-number /
                     "ALL" SP sequence-set /
                     "COUNT" SP number
                     ;; conforms to the generic
                     ;; search-return-data syntax defined
                     ;; in [IMAPABNF]

search-return-opt   = "MIN" / "MAX" / "ALL" / "COUNT"
                     ;; conforms to generic search-return-opt
                     ;; syntax defined in [IMAPABNF]

```

When the CONDSTORE [CONDSTORE] IMAP extension is also supported, the ABNF is updated as follows:

```

search-return-data =/ "MODSEQ" SP mod-sequence-value
                     ;; mod-sequence-value is defined
                     ;; in [CONDSTORE]

```

## 5. Security Considerations

In the general case, the IMAP SEARCH/UID SEARCH commands can be CPU and/or IO intensive, and are seen by some as a potential attack point for denial of service attacks, so some sites/implementations even disable them entirely. This is quite unfortunate, as SEARCH command is one of the best examples demonstrating IMAP advantage over POP3.

The ALL and COUNT return options don't change how SEARCH is working internally; they only change how information about found messages is returned. MIN and MAX SEARCH result options described in this document can lighten the load on IMAP servers that choose to optimize SEARCHes containing only one or both of them.

It is believed that this extension doesn't raise any additional security concerns not already discussed in [IMAP4].

## 6. IANA Considerations

IMAP4 capabilities are registered by publishing a standards track RFC or an IESG-approved experimental RFC. The registry is currently located at <<http://www.iana.org/assignments/imap4-capabilities>>.

This document defines the ESEARCH IMAP capability, which IANA added to the registry.

## 7. Normative References

- [KEYWORDS] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.
- [IMAP4] Crispin, M., "INTERNET MESSAGE ACCESS PROTOCOL - VERSION 4rev1", RFC 3501, March 2003.
- [ABNF] Crocker, D. (Ed.) and P. Overell, "Augmented BNF for Syntax Specifications: ABNF", RFC 4234, October 2005.
- [IMAPABNF] Melnikov, A. and C. Daboo, "Collected Extensions to IMAP4 ABNF", RFC 4466, April 2006..
- [CONDSTORE] Melnikov, A. and S. Hole, "IMAP Extension for Conditional STORE", RFC 4551, June 2006.

## 8. Acknowledgments

Thanks to Michael Wener, Arnt Gulbrandsen, Cyrus Daboo, Mark Crispin, and Pete Maclean for comments and corrections.

## Authors' Addresses

Alexey Melnikov  
Isode Limited  
5 Castle Business Village  
36 Station Road  
Hampton, Middlesex, TW12 2BX  
UK

EMail: Alexey.Melnikov@isode.com

Dave A. Cridland  
Inventure Systems Limited

EMail: dave.cridland@inventuresystems.co.uk  
URL: <http://invsys.co.uk/dave/>

## Full Copyright Statement

Copyright (C) The IETF Trust (2006).

This document is subject to the rights, licenses and restrictions contained in BCP 78, and except as set forth therein, the authors retain all their rights.

This document and the information contained herein are provided on an "AS IS" basis and THE CONTRIBUTOR, THE ORGANIZATION HE/SHE REPRESENTS OR IS SPONSORED BY (IF ANY), THE INTERNET SOCIETY, THE IETF TRUST, AND THE INTERNET ENGINEERING TASK FORCE DISCLAIM ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

## Intellectual Property

The IETF takes no position regarding the validity or scope of any Intellectual Property Rights or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; nor does it represent that it has made any independent effort to identify any such rights. Information on the procedures with respect to rights in RFC documents can be found in BCP 78 and BCP 79.

Copies of IPR disclosures made to the IETF Secretariat and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this specification can be obtained from the IETF on-line IPR repository at <http://www.ietf.org/ipr>.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights that may cover technology that may be required to implement this standard. Please address the information to the IETF at [ietf-ipr@ietf.org](mailto:ietf-ipr@ietf.org).

## Acknowledgement

Funding for the RFC Editor function is currently provided by the Internet Society.



