Sieve Email Filtering: Variables Extension

Status of This Memo

Abstract

   In advanced mail filtering rule sets, it is useful to keep state or
   configuration details across rules. This document updates the Sieve
   filtering language (RFC 5228) with an extension to support variables.
   The extension changes the interpretation of strings, adds an action
   to store data in variables, and supplies a new test so that the value
   of a string can be examined.

1. Introduction

    This is an extension to the Sieve language defined by [SIEVE]. It
    adds support for storing and referencing named data. The mechanisms
    detailed in this document will only apply to Sieve scripts that
    include a require clause for the "variables" extension. The require
    clauses themselves are not affected by this extension.

    Conventions for notations are as in [SIEVE] section 1.1, including
    use of [KEYWORDS] and [ABNF]. The grammar builds on the grammar of
    [SIEVE]. In this document, "character" means a character from the
    ISO 10646 coded character set [ISO10646], which may consist of
    multiple octets coded in [UTF-8], and "variable" is a named reference
    to data stored or read back using the mechanisms of this extension.

2. Capability Identifier

    The capability string associated with the extension defined in this
    document is "variables".

3. Interpretation of Strings

    This extension changes the semantics of quoted-string, multi-line-
    literal and multi-line-dotstuff found in [SIEVE] to enable the
    inclusion of the value of variables.

    When a string is evaluated, substrings matching variable-ref SHALL be
    replaced by the value of variable-name. Only one pass through the
    string SHALL be done. Variable names are case insensitive, so "foo"
    and "FOO" refer to the same variable. Unknown variables are replaced
    by the empty string.

        variable-ref   = "${" [namespace] variable-name "}"
        namespace   = identifier "." *sub-namespace
        sub-namespace   = variable-name "."
        variable-name   = num-variable / identifier
        num-variable   = 1*DIGIT

    Examples:
        "&%${}!"   => unchanged, as the empty string is an illegal
                        identifier
        "${doh!}"   => unchanged, as "!" is illegal in identifiers

        The variable "company" holds the value "ACME". No other variables
        are set.

        "${full}"   => the empty string
        "${company}"   => "ACME"

```
   "${BAD${Company}}" => "${BADACME"
   "${President, ${Company} Inc.}"
                       => "${President, ACME Inc.}"
```

   The expanded string MUST use the variable values that are current
   when control reaches the statement the string is part of.

   Strings where no variable substitutions take place are referred to as
   constant strings. Future extensions may specify that passing non-
   constant strings as arguments to its actions or tests is an error.

   Namespaces are meant for future extensions that make internal state
   available through variables. These variables SHOULD be put in a
   namespace whose first component is the same as its capability string.
   Such extensions SHOULD state which, if any, of the variables in its
   namespace are modifiable with the "set" action.

   References to namespaces without a prior require statement for the
   relevant extension MUST cause an error.

   Tests or actions in future extensions may need to access the
   unexpanded version of the string argument and, e.g., do the expansion
   after setting variables in its namespace. The design of the
   implementation should allow this.

3.1. Quoting and Encoded Characters

   The semantics of quoting using backslash are not changed: backslash
   quoting is resolved before doing variable substitution. Similarly,
   encoded character processing (see Section 2.4.2.4 of [SIEVE]) is
   performed before doing variable substitution, but after quoting.

   Examples:
      "${fo\o}" => ${foo} => the expansion of variable foo.
      "${fo\\o}" => ${fo\o} => illegal identifier => left verbatim.
      "\${foo}" => ${foo} => the expansion of variable foo.
      "\\${foo}" => \${foo} => a backslash character followed by the
                               expansion of variable foo.

      If it is required to include a character sequence such as
      "${beep}" verbatim in a text literal, the user can define a
      variable to circumvent expansion to the empty string.

   Example:
      set "dollar" "$";
      set "text" "regarding ${dollar}{beep}";
```

Example:
```
require ["encoded-character", "variables"];
set "name" "Ethelbert"
if header :contains "Subject" "dear${hex:20 24 7b 4e}ame}" {
    # the test string is "dear Ethelbert"
}
```

3.2.  Match Variables

A "match variable" has a name consisting only of decimal digits and
has no namespace component.

The decimal value of the match variable name will index the list of
matching strings from the most recently evaluated successful match of
type ":matches".  The list is empty if no match has been successful.

   Note: Extra leading zeroes are allowed and ignored.

The list will contain one string for each wildcard ("?" and "*") in
the match pattern.  Each string holds the substring from the source
value that the corresponding wildcard expands to, possibly the empty
string.  The wildcards match as little as possible (non-greedy
matching).

The first string in the list has index 1.  If the index is out of
range, the empty string will be substituted.  Index 0 contains the
matched part of the source value.

The interpreter MUST short-circuit tests, i.e., not perform more
tests than necessary to find the result.  Evaluation order MUST be
left to right.  If a test has two or more list arguments, the
implementation is free to choose which to iterate over first.

An extension describing a new match type (e.g., [REGEX]) MAY specify
that match variables are set as a side effect when the match type is
used in a script that has enabled the "variables" extension.

Example:

```
require ["fileinto", "variables"];

if header :matches "List-ID" "*<*@*" {
    fileinto "INBOX.lists.${2}"; stop;
}
```

```
    # Imagine the header
    # Subject: [acme-users] [fwd] version 1.0 is out
    if header :matches "Subject" "[*] *" {
        # ${1} will hold "acme-users",
        # ${2} will hold "[fwd] version 1.0 is out"
        fileinfo "INBOX.lists.${1}"; stop;
    }

    # Imagine the header
    # To: coyote@ACME.Example.COM
    if address :matches ["To", "Cc"] ["coyote@**.com",
            "wile@**.com"] {
        # ${0} is the matching address
        # ${1} is always the empty string
        # ${2} is part of the domain name ("ACME.Example")
        fileinto "INBOX.business.${2}"; stop;
    } else {
        # Control wouldn't reach this block if any match was
        # successful, so no match variables are set at this
        # point.
    }

    if anyof (true, address :domain :matches "To" "*.com") {
        # The second test is never evaluated, so there are
        # still no match variables set.
        stop;
    }
```

4. Action set

    Usage: set [MODIFIER] <name: string> <value: string>

    The "set" action stores the specified value in the variable
    identified by name. The name MUST be a constant string and conform
    to the syntax of variable-name. Match variables cannot be set. A
    namespace cannot be used unless an extension explicitly allows its
    use in "set". An invalid name MUST be detected as a syntax error.

    Modifiers are applied on a value before it is stored in the variable.
    See the next section for details.

    Variables are only visible to the currently running script. Note:
    Future extensions may provide different scoping rules for variables.

    Variable names are case insensitive.

Example:
```
    set "honorific"  "Mr";
    set "first_name" "Wile";
    set "last_name"  "Coyote";
    set "vacation" text:
    Dear ${HONORIFIC} ${last_name},
    I'm out, please leave a message after the meep.
    .
    ;
```

"set" does not affect the implicit keep. It is compatible with all
actions defined in [SIEVE].

4.1. Modifiers

Usage: ":lower" / ":upper" / ":lowerfirst" / ":upperfirst" /
        ":quotewildcard" / ":length"

Modifier names are case insensitive. Unknown modifiers MUST yield a
syntax error. More than one modifier can be specified, in which case
they are applied according to this precedence list, largest value
first:

```
                +-------------------------------+
                | Precedence     Modifier       |
                +-------------------------------+
                |    40          :lower         |
                |                :upper         |
                +-------------------------------+
                |    30          :lowerfirst    |
                |                :upperfirst    |
                +-------------------------------+
                |    20          :quotewildcard |
                +-------------------------------+
                |    10          :length        |
                +-------------------------------+
```

It is an error to use two or more modifiers of the same precedence in
a single "set" action.

Examples:
```
    # The value assigned to the variable is printed after the arrow
    set "a" "juMBlEd lETteRS";              => "juMBlEd lETteRS"
    set :length "b" "${a}";                 => "15"
    set :lower "b" "${a}";                  => "jumbled letters"
    set :upperfirst "b" "${a}";             => "JuMBlEd lETteRS"
    set :upperfirst :lower "b" "${a}";      => "Jumbled letters"
    set :quotewildcard "b" "Rock*";         => "Rock\*"
```

4.1.1. Modifier ":length"

   The value is the decimal number of characters in the expansion,
   converted to a string.

4.1.2. Modifier ":quotewildcard"

   This modifier adds the necessary quoting to ensure that the expanded
   text will only match a literal occurrence if used as a parameter to
   :matches. Every character with special meaning ("*", "?", and "\")
   is prefixed with "\" in the expansion.

4.1.3. Case Modifiers

   These modifiers change the letters of the text from upper to lower
   case or vice versa. Characters other than "A"-"Z" and "a"-"z" from
   US-ASCII are left unchanged.

4.1.3.1. Modifier ":upper"

   All lower case letters are converted to their upper case
   counterparts.

4.1.3.2. Modifier ":lower"

   All upper case letters are converted to their lower case
   counterparts.

4.1.3.3. Modifier ":upperfirst"

   The first character of the string is converted to upper case if it is
   a letter and set in lower case. The rest of the string is left
   unchanged.

4.1.3.4. Modifier ":lowerfirst"

   The first character of the string is converted to lower case if it is
   a letter and set in upper case. The rest of the string is left
   unchanged.

5. Test string

   Usage: string [MATCH-TYPE] [COMPARATOR]
           <source: string-list> <key-list: string-list>

   The "string" test evaluates to true if any of the source strings
   matches any key. The type of match defaults to ":is".

In the "string" test, both source and key-list are taken from the
script, not the message, and whitespace stripping MUST NOT be done
unless the script explicitly requests this through some future
mechanism.

Example:
```
   set "state" "${state} pending";
   if string :matches " ${state} " "* pending *" {
       # the above test always succeeds
   }
```

The "relational" extension [RELATIONAL] adds a match type called
":count". The count of a single string is 0 if it is the empty
string, or 1 otherwise. The count of a string list is the sum of the
counts of the member strings.

6. Implementation Limits

   An implementation of this document MUST support at least 128 distinct
   variables. The supported length of variable names MUST be at least
   32 characters. Each variable MUST be able to hold at least 4000
   characters. Attempts to set the variable to a value larger than what
   the implementation supports SHOULD be reported as an error at
   compile-time if possible. If the attempt is discovered during run-
   time, the value SHOULD be truncated, and it MUST NOT be treated as an
   error.

   Match variables ${1} through ${9} MUST be supported. References to
   higher indices than those the implementation supports MUST be treated
   as a syntax error, which SHOULD be discovered at compile-time.

7. Security Considerations

   When match variables are used, and the author of the script isn't
   careful, strings can contain arbitrary values controlled by the
   sender of the mail.

   Since values stored by "set" that exceed implementation limits are
   silently truncated, it's not appropriate to store large structures
   with security implications in variables.

   The introduction of variables makes advanced decision making easier
   to write, but since no looping construct is provided, all Sieve
   scripts will terminate in an orderly manner.

   Sieve filtering should not be relied on as a security measure against
   hostile mail messages. Sieve is designed to do simple, mostly static
   tests, and is not suitable for use as a spam or virus checker, where

the perpetrator has a motivation to vary the format of the mail in
order to avoid filtering rules. See also [SPAMTEST].

8. IANA Considerations

   The following template specifies the IANA registration of the
   variables Sieve extension specified in this document:

   To: iana@iana.org
   Subject: Registration of new Sieve extension

   Capability name: variables
   Description: Adds support for variables to the Sieve filtering
                    language.
   RFC number: RFC 5229
   Contact address: The Sieve discussion list <ietf-mta-filters@imc.org>

9. Acknowledgments

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   Jeffrey Hutzelman, Mark E. Mallett, Alexey Melnikov, Peder Stray, and
   Nigel Swinson for valuable feedback.

10. References

10.1. Normative References

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   [UTF-8]   Yergeau, F., "UTF-8, a transformation format of Unicode
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10.2. Informative References

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                amendments.

   [REGEX]   Murchison, K., "Sieve Email Filtering -- Regular
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   [SPAMTEST]   Daboo, C., "Sieve Email Filtering: Spamtest and
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