Handling the workflow of pkgsrc Security Team

An introduction to nmh (new MH message system), a look to the workflow of pkgsrc Security Team and how to (possibly) automate the automatable stuffs!

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Outline

An introduction to nmh (New Message Handler)

MH Mail System

- Initially developed in 1978 at RAND
- MH two main design decisions:
  - MH commands - the primitive operations on a message - are UNIX shell commands
  - Each MH message is a normal UNIX file
- Ease (ab)using the handling of emails via Unix shell scripting

nmh (new MH message system)

- Based on MH version 6.8.3
- Available under `modified-bsd` `LICENSE`
- Very nice and friendly community!
- Intended to be a compatible drop-in replacement for MH
- Suite of simple single-purpose programs to send, receive, save, retrieve and manipulate email messages
- Available in pkgsrc as `mail/nmh`

nmh (new MH message system): MH mailbox format

- Every email message is just a file (e.g. `123`) in a folder [1] (e.g. `pkgsrc-users`)
- Most `nmh` commands operates on a folder (e.g. `+pkgsrc-users`) and a range of messages (e.g. `123`)
- Current folder can be omitted and is stored in the user's context (`` `mhpath +`/`mhparam context` ``) [2]
- Current message can be omitted and is stored in folder mh-sequences file (`` `mhpath`/`mhparam mh-sequences` ``) [3]
- Per-folder mh-sequences is also used to:
  - Special `Unseen-Sequence` to mark unread messages
  - Mark a range of messages with a user defined sequence

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[1] A directory in the file system

[2] E.g. In `~/Mail/.context`: `Current-Folder: pkgsrc-users`

[3] E.g. In `~/Mail/pkgsrc-users/.mh_sequences`: `cur: 123`

Practical look of a subset of nmh commands

scan	produce a summary listing of nmh messages
show	display nmh messages
prev	show the previous nmh message
next	show the next nmh message
folder	set current nmh folder
new	report on nmh folders with new messages
fprev	set current nmh folder to previous folder with new messages
fnext	set current nmh folder to next folder with new messages
unseen	scan any new messages in all nmh folders
pick	search nmh messages
mark	manipulate nmh message sequences
comp	compose an nmh message
repl	reply to an nmh message

Subset of nmh commands: `scan`

> *«scan produces a one-line-per-message listing of the specified folder or messages. Each scan line contains the message number (name), the date, the "From:" field, the "Subject" field, and, if room allows, some of the body of the message.»* [4]

```
scan [-help] [-version] [+folder] [msgs] [-clear | -noclear] [-form
formatfile] [-format string] [-header | -noheader] [-width
columns] [-reverse | -noreverse] [-file filename]
```

```
% scan +pkgsrc-changes last:5
 N  68024 Jonathan Perkin   Thu Jun 28 15:16 CVS commit: pkgsrc/textproc/ruby-nokogiri
 N  68025 Takahiro Kambe    Thu Jun 28 15:33 CVS commit: pkgsrc/security/py-acme
 N  68026 Takahiro Kambe    Thu Jun 28 15:34 CVS commit: pkgsrc/doc
 N  68027 Jonathan Perkin   Thu Jun 28 15:45 CVS commit: pkgsrc/www/libwww
>N  68028 Greg Troxel       Thu Jun 28 19:00 CVS commit: pkgsrc/ham/rtl-sdr
```

[4] From `scan(1)`

Subset of nmh commands: `show`

> *«show lists each of the specified messages to the standard output (typically, the terminal).»* [5]

```
show [-help] [-version] [+folder] [msgs] [-draft] [-showproc program]
[-showmimeproc program] [-header | -noheader] [-checkmime |
-nocheckmime] [-concat | -noconcat] [switches for showproc or
showmimeproc]
```

```
% show +pkgsrc-users 6391
Date:    Tue, 19 Jun 2018 16:20:24 +0200
To:      pkgsrc-users%netbsd.org@localhost
From:    Thomas Merkel <tm%netbsd.org@localhost>
Subject: pkgsrcCon 2018 in Berlin, 6.-8. July

Dear pkgsrc users and contributors,

this is a friendly reminder about the pkgsrcCon which takes place
in Berlin this year. If you like to present a talk, please send the
title, slot duration and brief description for the website to
pkgsrcCon2018@NetBSD.org.
[...]
```

[5] From `show(1)`

Subset of nmh commands: `prev`

> *«prev performs a show on the previous message in the specified (or current) folder. [...] This command is almost exactly equivalent to "show prev".»* [6]

```
prev [-help] [-version] [+folder] [-showproc program] [-showmimeproc
program] [-header | -noheader] [-checkmime | -nocheckmime]
[switches for showproc or showmimeproc]
```

[6] From `prev(1)`

Subset of nmh commands: `next`

> *«next performs a show on the next message in the specified (or current) folder. [...] This command is almost exactly equivalent to "show next".»* [7]

```
next [-help] [-version] [+folder] [-showproc program] [-showmimeproc
program] [-header | -noheader] [-checkmime | -nocheckmime]
[switches for showproc or showmimeproc]
```

[7] From `next(1)`

Subset of nmh commands: `folder`

> *«When folder is given the -print switch (the default), it lists: the current folder, the number of messages in it and their range (low-high), the folder's current message, and an indication of extra files, if any.»* [8]

```
folder [-help] [-version] [+folder] [msg] [-all | -noall] [-create |
-nocreate] [-fast | -nofast] [-header | -noheader] [-recurse |
-norecurse] [-total | -nototal] [-list | -nolist] [-push | -pop]
[-pack | -nopack] [-print] [-verbose | -noverbose]

folders is equivalent to folder -all

% folder
pkgsrc-changes+ has 68011 messages  (1-68030); cur=68028.

% folder -fast
pkgsrc-changes

% folder -all
FOLDER                              # MESSAGES  RANGE      ; CUR        (OTHERS)
[...]
pkgsrc-bugs                  has  9378 messages  (  1- 9379); cur= 9379.
pkgsrc-bulk                  has  5204 messages  (  1- 5204); cur= 5204.
pkgsrc-changes+              has 68011 messages  (  1-68031); cur=68030.
[...]

TOTAL = 363611 messages in 144 folders.
```

[8] From `folder(1)`

Subset of nmh commands: `new`

> *«new, in its default mode, produces a one-line-per-folder listing of all folders which contain messages in the specified sequences, or in the sequence(s) listed in the profile entry "Unseen-Sequence". Each line consists of the folder name, the total number of messages in the specified sequences, and a list of messages derived from the .mh_sequence file.»* [9]

```
new [-help] [-version] [sequences] [-mode mode] [-folders foldersfile]

fnext is equivalent to new -mode fnext

fprev is equivalent to new -mode fprev

unseen is equivalent to new -mode unseen


% new
netbsd-source-changes      1.  40500
pkgsrc-changes             2.  68029-68030
pkgsrc-wip-changes         1.  10349
 total                     4.
```

[9] From `new(1)`

Subset of nmh commands: `fprev`

> *«In fnext and fprev modes, new changes to the next or previous matching folder, respectively.»* [10]

```
new [-help] [-version] [sequences] [-mode mode] [-folders foldersfile]

fnext is equivalent to new -mode fnext

fprev is equivalent to new -mode fprev

unseen is equivalent to new -mode unseen


% fprev
netbsd-source-changes  40500

% fprev
pkgsrc-changes  68029-68030
```

[10] From `fprev(1)`

Subset of nmh commands: `fnext`

> *«In fnext and fprev modes, new changes to the next or previous matching folder, respectively.»* [11]

```
new [-help] [-version] [sequences] [-mode mode] [-folders foldersfile]

fnext is equivalent to new -mode fnext

fprev is equivalent to new -mode fprev

unseen is equivalent to new -mode unseen


% fnext
pkgsrc-changes  68029-68030

% fnext
pkgsrc-wip-changes  10349
```

[11] From `fnext(1)`

Subset of nmh commands: unseen

> *«In unseen mode, new executes scan sequences for each matching folder.»* [12]

```
new [-help] [-version] [sequences] [-mode mode] [-folders foldersfile]

fnext is equivalent to new -mode fnext

fprev is equivalent to new -mode fprev

unseen is equivalent to new -mode unseen


% unseen

1 unseen messages in netbsd-source-changes
 N  40500 Kamil Rytarowski  Fri Jun 29 11:33 CVS commit: src

2 unseen messages in pkgsrc-changes
 N  68029 Jonathan Perkin   Fri Jun 29 11:27 CVS commit: pkgsrc/pkgtools/pkgin
 N  68030 Jonathan Perkin   Fri Jun 29 11:28 CVS commit: pkgsrc/doc

1 unseen messages in pkgsrc-wip-changes
 N  10349 Havard Eidnes     Tue Jun 26 22:42 Do away with use of pip in setup.py.
```

[12] From unseen(1)

Subset of nmh commands: `pick`

> *«pick searches within a folder for messages with the specified contents, and then identifies those messages. Two types of search primitives are available: pattern matching and date constraint operations.»* [13]

```
pick [-help] [-version] [+folder] [msgs] [-reverse ...] [-and ...] [-or
...] [-not ...] [-lbrace ...  -rbrace] [--component pattern] [-cc
pattern] [-date pattern] [-from pattern] [-search pattern]
[-subject pattern] [-to pattern] [-after date] [-before date]
[-datefield field] [-sequence name ...] [-nosequence] [-public |
-nopublic] [-zero | -nozero] [-list | -nolist] [-debug]
```

```
% pick -search 'CVE-' +pkgsrc-changes last:150
67887
67990
67992
68015
68019
```

```
% scan `pick -search 'CVE-' +pkgsrc-changes last:150`
 N  67887 Thomas Klausner   Sun Jun 24 10:16 CVS commit: pkgsrc/graphics/GraphicsMagick
 N  67990 Maya Rashish      Tue Jun 26 21:49 CVS commit: pkgsrc/www/firefox52
 N  67992 Maya Rashish      Tue Jun 26 23:29 CVS commit: pkgsrc/www/seamonkey
 N  68015 Ryo ONODERA       Thu Jun 28 13:52 CVS commit: pkgsrc/www/firefox
 N  68019 Ryo ONODERA       Thu Jun 28 14:04 CVS commit: pkgsrc/www/firefox60
```

[13] From `pick(1)`

Subset of nmh commands: `mark`

> *«The mark command manipulates message sequences by adding or deleting message numbers from folder-specific message sequences, or by listing those sequences and messages.»* [14]

```
mark [-help] [-version] [+folder] [msgs] [-sequence name ...] [-add |
-delete] [-list] [-public | -nopublic] [-zero | -nozero]
```

```
% scan ‘pick -from maya -and -search ’CVE-’ +pkgsrc-changes last:150‘
 N  67990 Maya Rashish      Tue Jun 26 21:49 CVS commit: pkgsrc/www/firefox52
 N  67992 Maya Rashish      Tue Jun 26 23:29 CVS commit: pkgsrc/www/seamonkey

% mark -sequence needspullup ‘pick -from maya -and -search ’CVE-’ +pkgsrc-changes last:150‘

% scan needspullup
 N  67990 Maya Rashish      Tue Jun 26 21:49 CVS commit: pkgsrc/www/firefox52
 N  67992 Maya Rashish      Tue Jun 26 23:29 CVS commit: pkgsrc/www/seamonkey
```

[14] From `mark(1)`

pkgsrc Security Team tasks and workflow

Mission

The mission of pkgsrc Security Team is:

- ensure that packages in pkgsrc are safe
- be sure pkgsrc users are aware of the known vulnerabilities

Who?

Current members of `pkgsrc-security@` are:

- Alistair G. Crooks (<agc>)
- Daniel Horecki (<morr>)
- Thomas Klausner (<wiz>)
- Tobias Nygren (<tnn>)
- Ryo ONODERA (<ryoon>)
- Fredrik Pettai (<pettai>)
- Jörg Sonnenberger (<joerg>)
- Leonardo Taccari (<leot>)
- Tim Zingelman (<tez>)

pkgsrc-security@ rotation list

Daniel Horecki <morr>, Tobias Nygren <tnn>, Ryo ONODERA <ryoon> and Leonardo Taccari <leot> are in the pkgsrc-security@ rotation list.

- Each person is 'on' from Tuesday till Monday (once every 4 weeks)
- Ensure that all tickets get handled ASAP
  - reject the ones not affecting pkgsrc
  - add entries to pkg-vulnerabilities
  - inform the MAINTAINER (if any)

RT tickets and the pkgsrc-security queue

- Each vulnerability is handled via RT (Request Tracker) ticketing system
- Public security feeds/MLs (e.g. NIST for CVEs) create new tickets on RT
- Every new ticket and/or RT comments are also received by `pkgsrc-security@` (as emails)

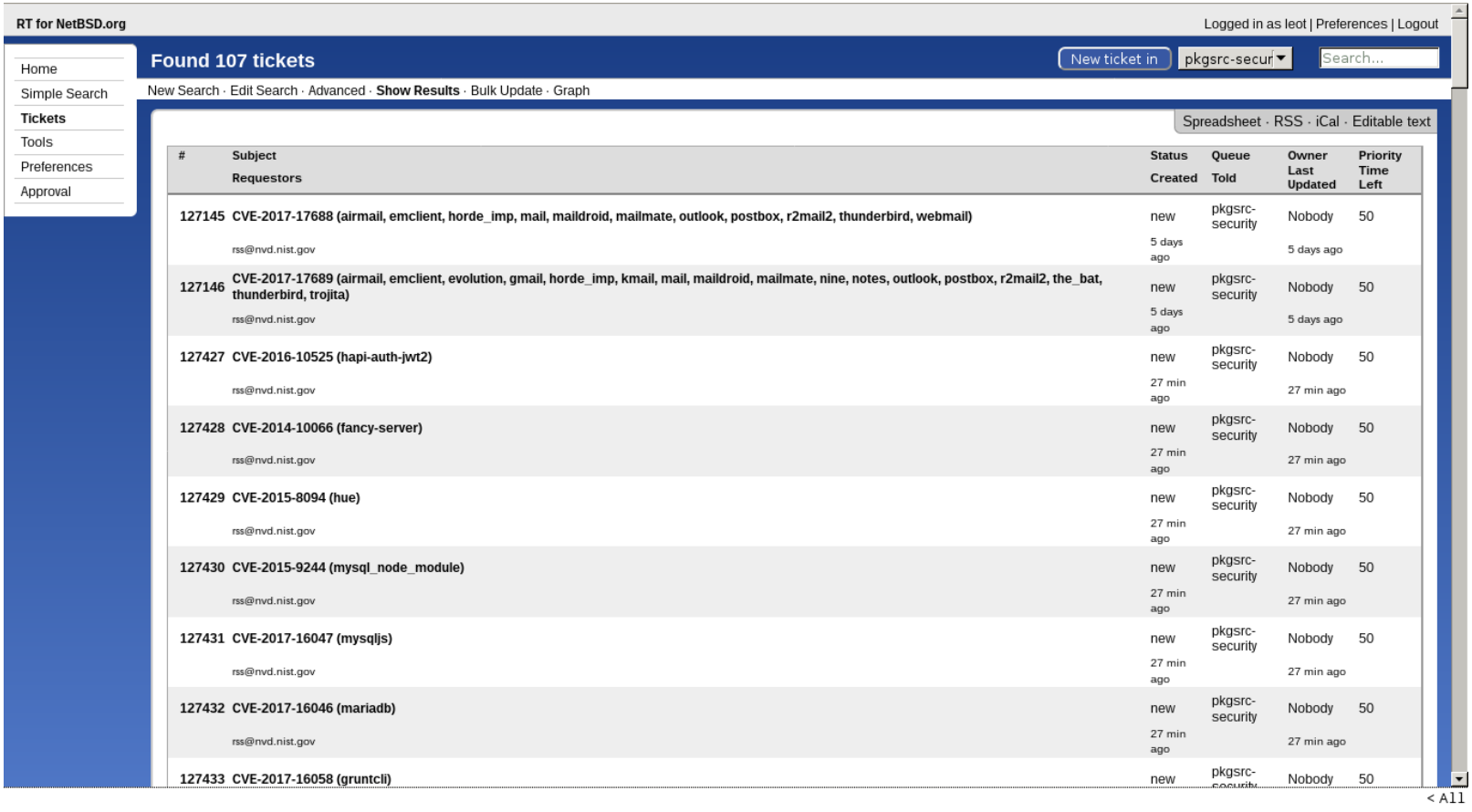
RT ticket statuses used by pkgsrc-security@

new	new (usually unhandled) ticket
rejected	duplicate issues and ones that do not apply to pkgsrc
resolved	ticket that impacts pkgsrc and entry added to `pkg-vulnerabilities`

Handling new tickets

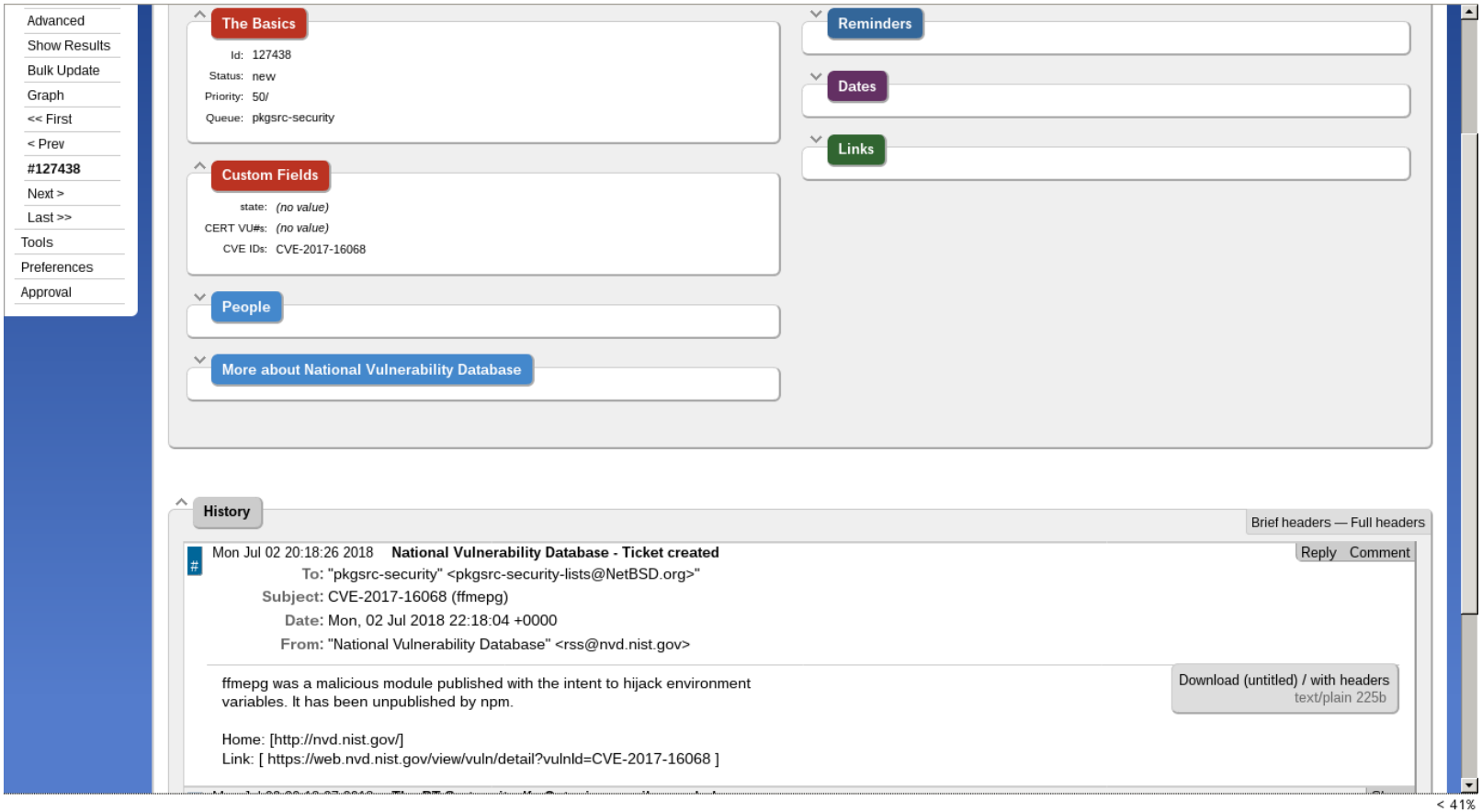
- Is the ticket a duplicate?
  - Mark its status as 'rejected'
  - Add a 'duplicate' comment
- Does the ticket **not** apply to pkgsrc?
  - Mark its status as 'rejected' and
  - Add a 'No impact on pkgsrc' comment.
- Does the ticket apply to pkgsrc?
  - Add an entry to `pkg-vulnerabilities`
  - Mark its status as 'resolved'
  - Contact `MAINTAINER` (if any)

RT tickets (web interface)



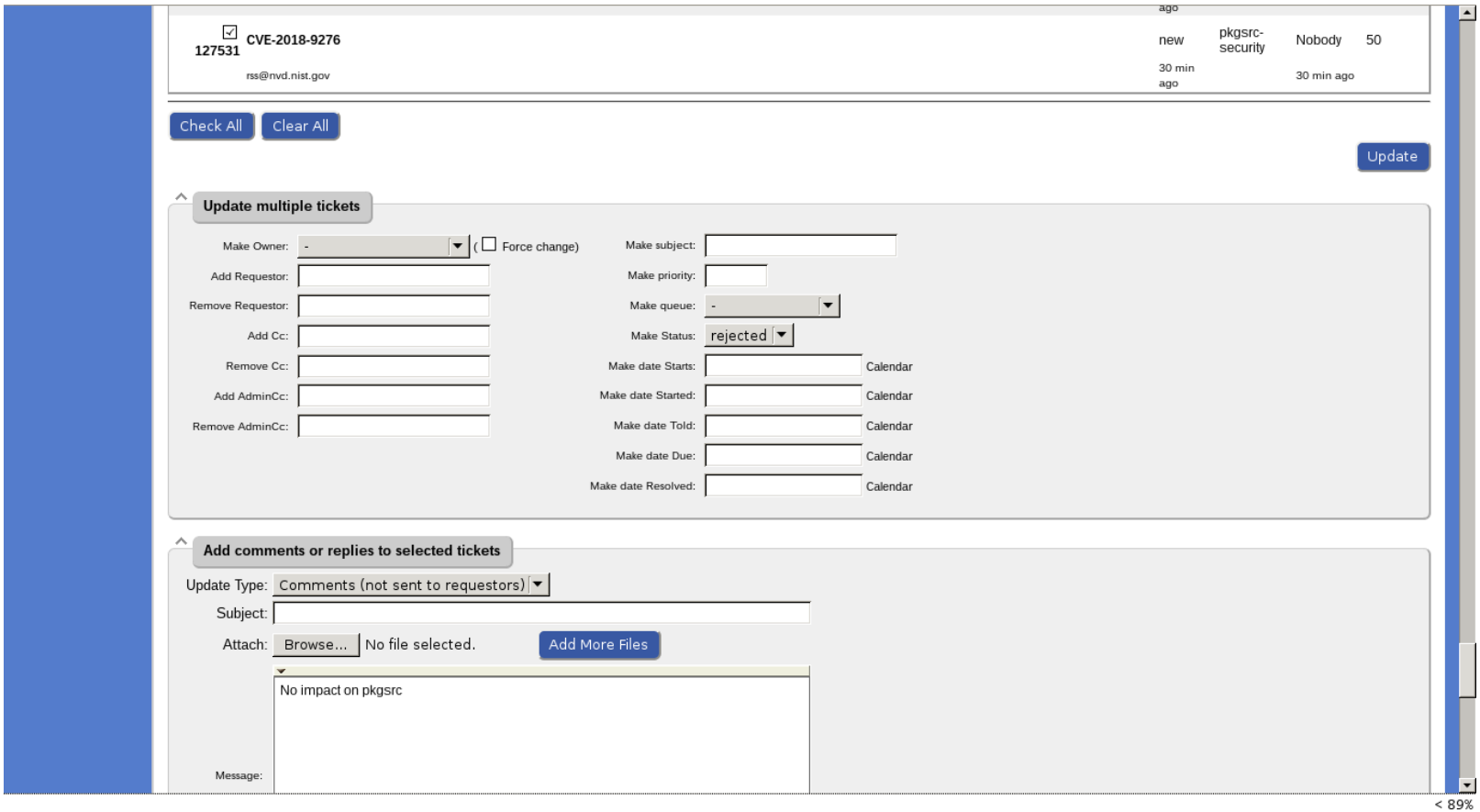
Screenshot of new RT tickets for the pkgsrc-security queue

RT ticket #127438 – CVE-2017-16068



Screenshot of RT ticket #127438, CVE-2017-16068

Updating multiple tickets on RT



Screenshot of updating multiple tickets on RT

pkg_admin(1) and vulnerabilities

pkg_admin(1) has several commands to inform users about vulnerable packages installed on system.

audit print a list of all installed packages that contain vulnerabilities On NetBSD, if the check_pkg_vulnerabilities option is set (it is by default [15]) the daily(5) cron job will list all vulnerability packages installed.

fetch-pkg-vulnerabilities fetch a new pkg-vulnerabilities file [16]. This is disabled by default and can be configured via daily.conf(5) by adding fetch_pkg_vulnerabilities=YES in /etc/daily.conf.

[15] Please give a look to security.conf(5) if you are curious!

[16] By default it is downloaded from ftp.NetBSD.org

pkg_admin audit in action

```
% pkg_admin audit
Package pcre-8.42 has a denial-of-service vulnerability, see
    https://nvd.nist.gov/vuln/detail/CVE-2017-11164
Package libxslt-1.1.32 has a insufficiently-random-numbers vulnerability, see
    https://nvd.nist.gov/vuln/detail/CVE-2015-9019
Package jpeg-9c has a denial-of-service vulnerability, see
    https://nvd.nist.gov/vuln/detail/CVE-2018-11813
[...]
```

pkg-vulnerabilities

`pkg-vulnerabilities` is a TSV [17] that contains 3-uples:

- package `PKGNAME` patterns [18]
- type of exploit (e.g. `denial-of-service`, `buffer-overflow`, `multiple-vulnerabilities`, `eol`, ...)
- URL URL that contains details about the vulnerability (often to `nvd.nist.gov` for CVEs)

[17] Actually [\t]SV!, i.e. `awk '! /^#/ { print $1, $2, $3 }'` will DTRT!

[18] In case of doubt you can use `pkg_admin pmatch pattern pkg` that returns true if 'pkg' matches 'pattern', e.g.
`pkg_admin pmatch 'foo<1.0' 'foo-1.0'` will return false.

Some numbers

Tickets handled in 2016	
Status	Tickets
rejected	10429
resolved	1367
stalled	0
Total	11796

Tickets handled in 2017	
Status	Tickets
rejected	23511
resolved	2847
stalled	2
Total	26360

- Number of vulnerable packages in pkgsrc head: 591 [19]
- Number of vulnerable packages in pkgsrc stable [2018Q1]: 624 [20]

[19] As of 2018-07-03 4:00 UTC
[20] As of 2018-07-03 4:00 UTC

Automating the automatable stuffs of pkgsrc-security

Request Tracker (RT) REST Interface

- Request Tracker (RT) provides a REST interface that permit to programmatically access RT databases.
- Both `devel/rt3` and `devel/rt4` provides a `rt` Perl script
- Other package/modules exists for several programming languages

`rt`: command-line interface to RT

- Perl script that can be used both non-interactively (directly passing action when invoking it) or interactively (if no action are passed, i.e. just by invoking it as 'rt')
- Actions most commonly used:

list	show a list of tickets
show	show information about a ticket (description, updates, comments)
edit	modify fields of a ticket
comment	add a comment to a ticket
help	print help message

rt actions: `list`

> *«Displays a list of objects matching the specified conditions. ("ls", "list", and "search" are synonyms.)»* [21]

```
rt <ls|list|search> [options] "query string"
```

To show all ticket in the 'new' status:

```
% rt ls -s Status=new
127145: CVE-2017-17688 (airmail, emclient, ...)
127146: CVE-2017-17689 (airmail, emclient, ...)
127451: CVE-2018-0499 (xapian)
127458: CVE-2018-10874 (ansible)
127470: CVE-2018-11489 (giflib, sam2p)
127472: CVE-2018-11490 (giflib, sam2p)
127504: CVE-2018-13033 (binutils)
127511: CVE-2018-13049 (php-glpi)
127517: CVE-2018-13066 (ming)
127537: CVE-2017-2615 (qemu)
127539: CVE-2018-10855 (ansible2)
127668: CVE-2018-13100 (linux)
127672: CVE-2018-13112 (tcpreplay)
127710: [SECURITY] [DSA 4238-1] exiv2 security update
127735: CVE-2018-3750 (npm)
```

[21] From `rt help list`

rt actions: show

«Displays details of the specified objects.» [22]

`rt show [options] <object-ids>`

To show information about ticket #127668:

```
% rt show 127668
Date: Tue Jul 03 20:19:32 2018
From: rss@nvd.nist.gov
X-Queue: pkgsrc-security
Subject: [rt #ticket/127668] CVE-2018-13100 (linux)

===> Ticket created by rss@nvd.nist.gov on Tue Jul  3 22:19:33 2018
An issue was discovered in fs/f2fs/super.c in the Linux kernel through 4.17.3,
which does not properly validate secs_per_zone in a corrupted f2fs image, as
demonstrated by a divide-by-zero error.

Home: [http://nvd.nist.gov/]
Link: [ https://web.nvd.nist.gov/view/vuln/detail?vulnId=CVE-2018-13100 ]
             544638: untitled (300b)
===> Outgoing email recorded by RT_System on Tue Jul  3 22:19:33 2018
             544640: untitled (606b)
===> CVE IDs CVE-2018-13100 added by leot on Wed Jul  4 11:21:08 2018
===> Subject changed from 'CVE-2018-13100' to 'CVE-2018-13100 (linux)'
     by leot on Wed Jul  4 12:05:33 2018
```

[22] From `rt help show`

rt actions: edit

> *«Edits information corresponding to the specified objects.»* [23]

```
rt edit [options] <object-ids> set field=value [field=value] ...
                               add field=value [field=value] ...
                               del field=value [field=value] ...
```

Ticket #127668 (CVE-2018-13100) does not affect pkgsrc so we can close it:

```
% rt edit 127668 set status=rejected
# Ticket 127668 updated.
```

[23] From `rt help edit`

rt actions: comment

> *«Adds a comment (or correspondence) to the specified ticket (the only difference being that comments aren't sent to the requestors.)»* [24]

`rt <comment|correspond> [options] <ticket-id>`

#127668 had no impact on pkgsrc, so let's add a comment about that:

```
% rt comment -m 'No impact on pkgsrc' 127668
# Message recorded
```

[24] From `rt help comment`

Automating tickets handling from the MUA (or, putting everything together!)

- All (new) RT tickets and comments ends up in an MH folder
- The CVE ones from NIST have a `CVE-[0-9]+-[0-9]+` pattern in the `Subject:`, we can automatically fill the `CVE IDs` field to RT
- All the ones that have no impact on pkgsrc can be marked with a special sequence (e.g. 'marked') and then automatically marked as 'rejected' with a 'No impact on pkgsrc' comment
- Usually when receiving CVE tickets no information about the package is present in the `Subject:`, they can be marked with a `PKGBASE` sequence (e.g. 'qemu') and then update the subject of the ticket accordingly to ease further processing when filling respective `pkg-vulnerabilities` entries

Automating tickets handling from the MUA (or, putting everything together!)

- Duplicate CVE tickets that are already in `pkg-vulnerabilities` can be automatically rejected by parsing `rt ls Status=new` output and URL field of `pkg-vulnerabilities` matching the `CVE-[0-9]+-[0-9]+` patterns
- Duplicate tickets in the pkgsrc-security queue can be easily rejected similarly
- After marking CVE tickets as described an entry for `pkg-vulnerabilities` can be populated with a template, e.g.:

```
PKGBASE-[0-9]+ TODO https://nvd.nist.gov/vuln/detail/CVE-<id>
```

Filling CVE IDs in the ticket

Instead of doing that in shell scripting and `rt`, it is easier to use `wip/py-rt`:

```
import rt

tracker = rt.Rt(RT_API_URL, basic_auth=(username, password))
tracker.login()

for ticket in tracker.search(Queue='pkgsrc-security', Status='new',
                             Subject__like='CVE', Format='s'):
    cves = re.findall('CVE-[0-9]+-[0-9]+', ticket['Subject'])
    if cves:
        fields = { 'CF_CVE IDs': ' '.join(cves) }
        tracker.edit_ticket(ticket['id'].replace('ticket/', ''), **fields)
```

Closing marked tickets

```
% scan +pkgsrc-security-rt marked
 N  81635 National Vulnerab Wed Jul 04 20:18 [NetBSD.org #127747] CVE-2018-13144
[...]
>N  81641 National Vulnerab Wed Jul 04 20:18 [NetBSD.org #127753] CVE-2018-13145

% scan -format '%{rt-ticket}' +pkgsrc-security-rt marked
NetBSD.org #127747
[...]
NetBSD.org #127753

% scan -format '%{rt-ticket}' +pkgsrc-security-rt marked | cut -d '#' -f 2
127747
[...]
127753

% scan -format '%{rt-ticket}' +pkgsrc-security-rt marked |
    cut -d '#' -f 2 | xargs rt edit set status=rejected
# Ticket 127747 updated.
[...]
# Ticket 127753 updated.

% scan -format '%{rt-ticket}' +pkgsrc-security-rt marked |
    cut -d '#' -f 2 | xargs -n 1 rt comment -m 'No impact on pkgsrc'
# Message recorded
[...]
# Message recorded
```

Report all 'new' CVE duplicate tickets

The format of `rt ls -s` is [25]:

```
<id>: <subject>
```

```
rt ls -s |
awk \
'
{
        # Get rid of ':' in the ticket id
        sub(/:$/, "", $1)
}

$2 ~ /CVE-[0-9]+-[0-9]+/ {
        id = $1
        cve = $2

        if (cves[cve])
                print id
        else
                cves[cve] = id
}
'
```

[25] E.g.: 127750: CVE-2018-13139

Report all CVE tickets that are already in pkg-vulnerabilities

```
(cat $pkgvulnerabilities ; rt ls -s ) | awk \
'
# Slurp pkg-vulnerabilities CVE entries in vuln[]
$3 ~ /CVE-[0-9]+-[0-9]+/ {
        pkgname = $1
        type = $2
        match($3, /CVE-[0-9]+-[0-9]+/)
        cve = substr($3, RSTART, RLENGTH)

        entry[cve] = $0

        next
}

# Parse rt ls -s output
$2 ~ /CVE-[0-9]+-[0-9]+/ {
        id = $1
        match($2, /CVE-[0-9]+-[0-9]+/)
        cve = substr($2, RSTART, RLENGTH)

        if (entry[cve]) {
                print id " " entry[cve]
        }
}
'
```

Conclusion

- Reading/skimming tickets needs humans...
- ...but at least when handling a lot of tickets scripting can ease a lot!

Thanks

- pkgsrc Security Team and everyone who help keeping up to date `pkg-vulnerabilities` and requests pullups!
- pkgsrc Releng for their work!

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Questions?