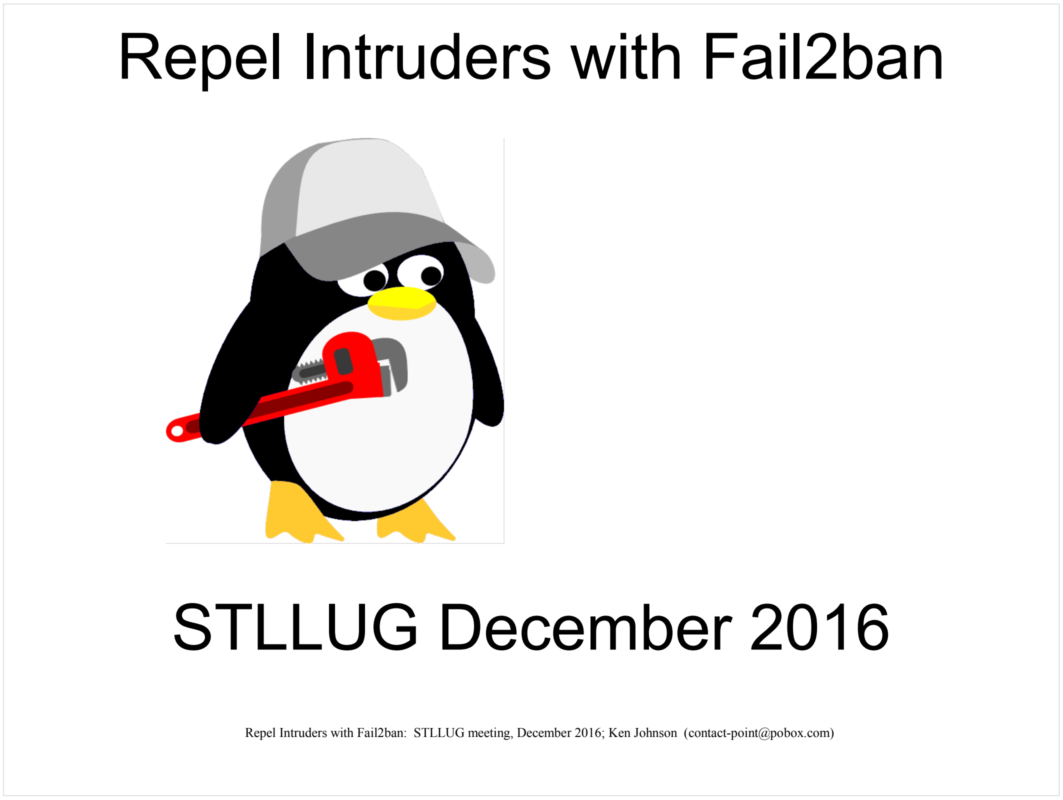
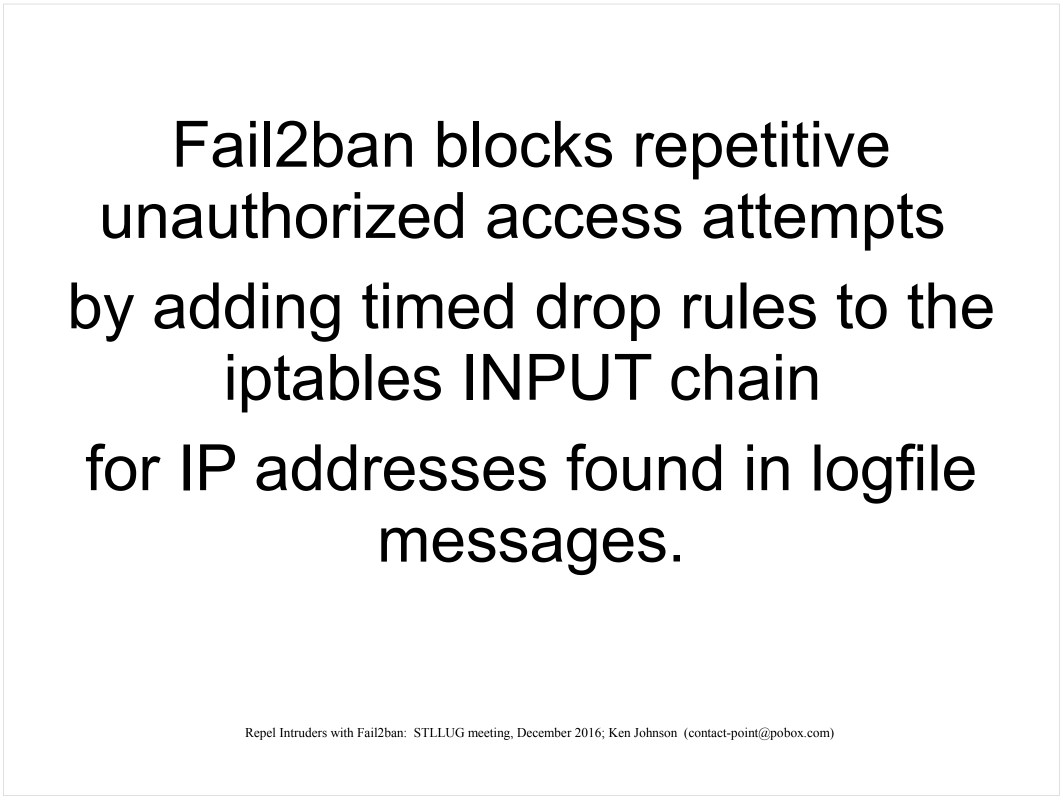


Repel Intruders with Fail2ban

STLLUG December 2016

Repel Intruders with Fail2ban: STLLUG meeting, December 2016; Ken Johnson (contact-point@pobox.com)

A somewhat revised and improved version of a talk given a year or two ago for STLLUG.



Fail2ban blocks repetitive unauthorized access attempts

by adding timed drop rules to the iptables INPUT chain

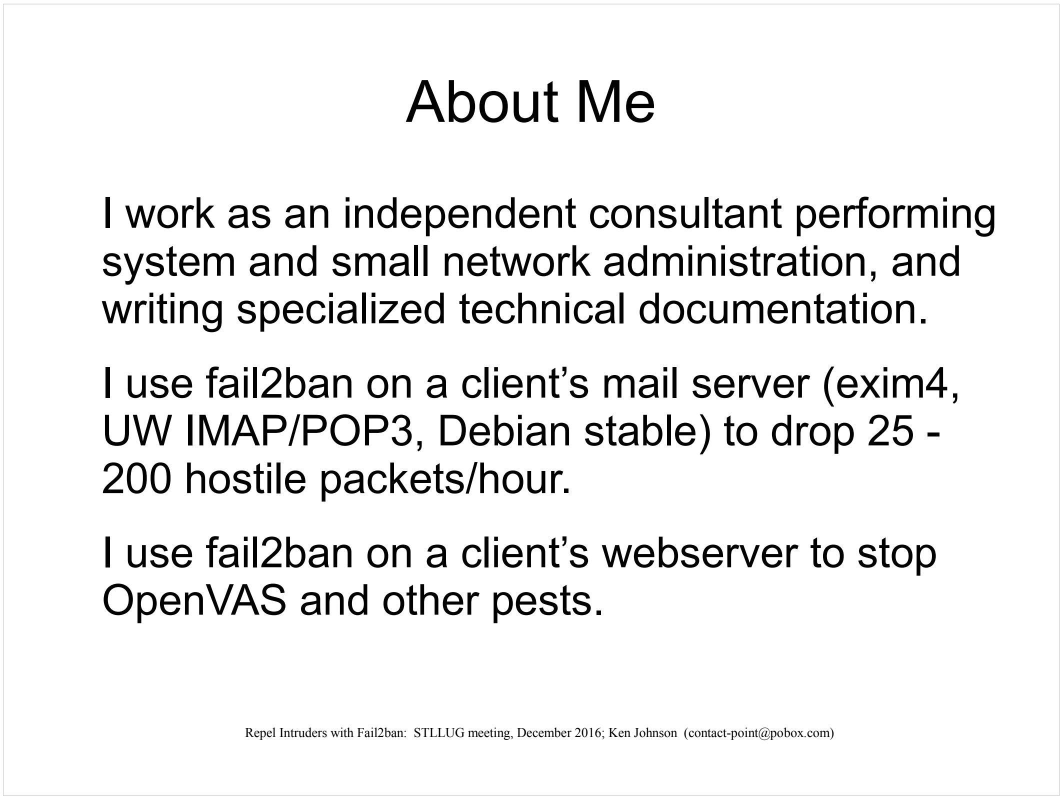
for IP addresses found in logfile messages.

(Fail2ban does not: – we will get to this later –

stop distributed attacks that use each zombie only once;

help if you are working in a virtual server without iptables, or you haven’t got root;

help if the logfile message does not include an IP address.)



About Me

I work as an independent consultant performing system and small network administration, and writing specialized technical documentation.

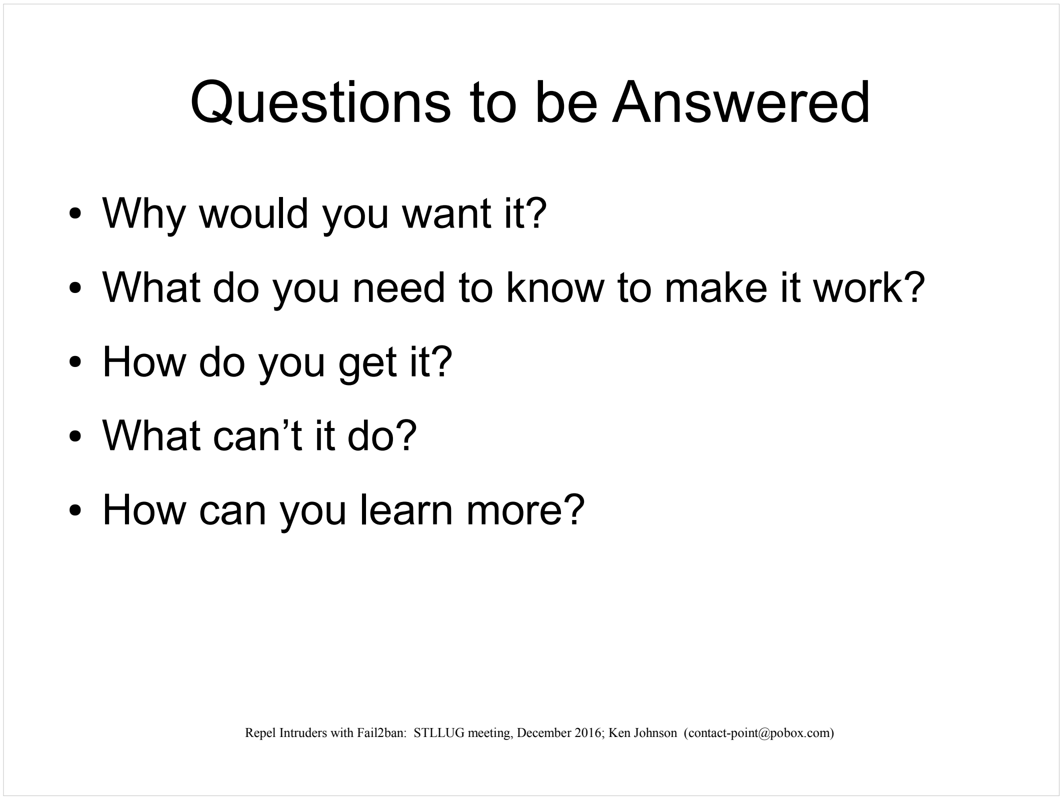
I use fail2ban on a client’s mail server (exim4, UW IMAP/POP3, Debian stable) to drop 25 - 200 hostile packets/hour.

I use fail2ban on a client’s webserver to stop OpenVAS and other pests.

XML or SGML based mil-spec documents

Run the Visual C++ debugger or read a switchbox schematic.

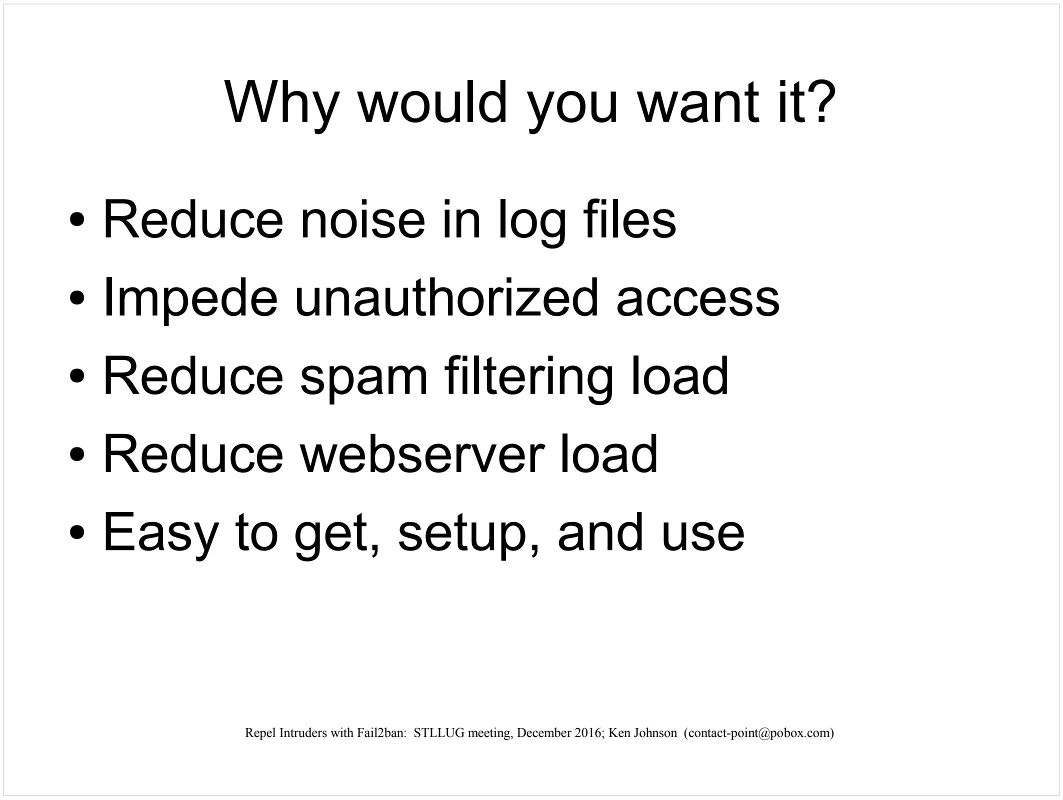
Generate 'picture books' for custom test program sets using Python and MS Word.



Questions to be Answered

- Why would you want it?
- What do you need to know to make it work?
- How do you get it?
- What can’t it do?
- How can you learn more?

What is it? – answered two slides back.

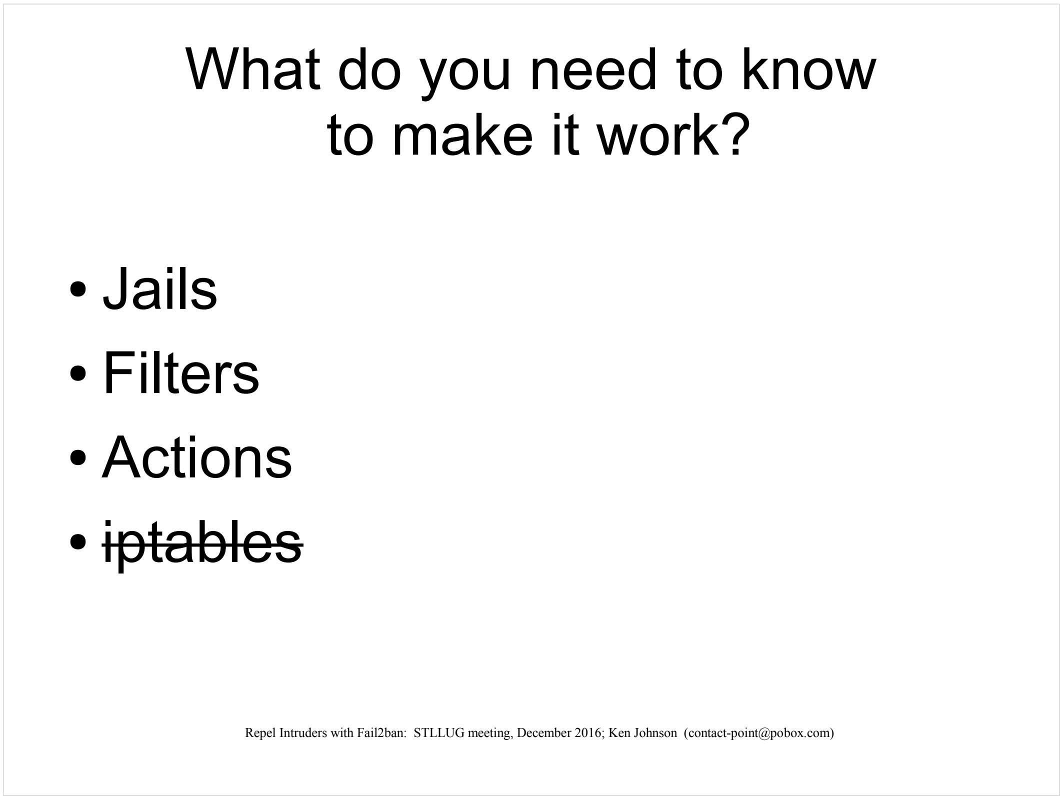


Why would you want it?

- Reduce noise in log files
- Impede unauthorized access
- Reduce spam filtering load
- Reduce webserver load
- Easy to get, setup, and use

Because you want to accomplish these things

Because it has these desirable features



What do you need to know to make it work?

- Jails
- Filters
- Actions
- ~~iptables~~

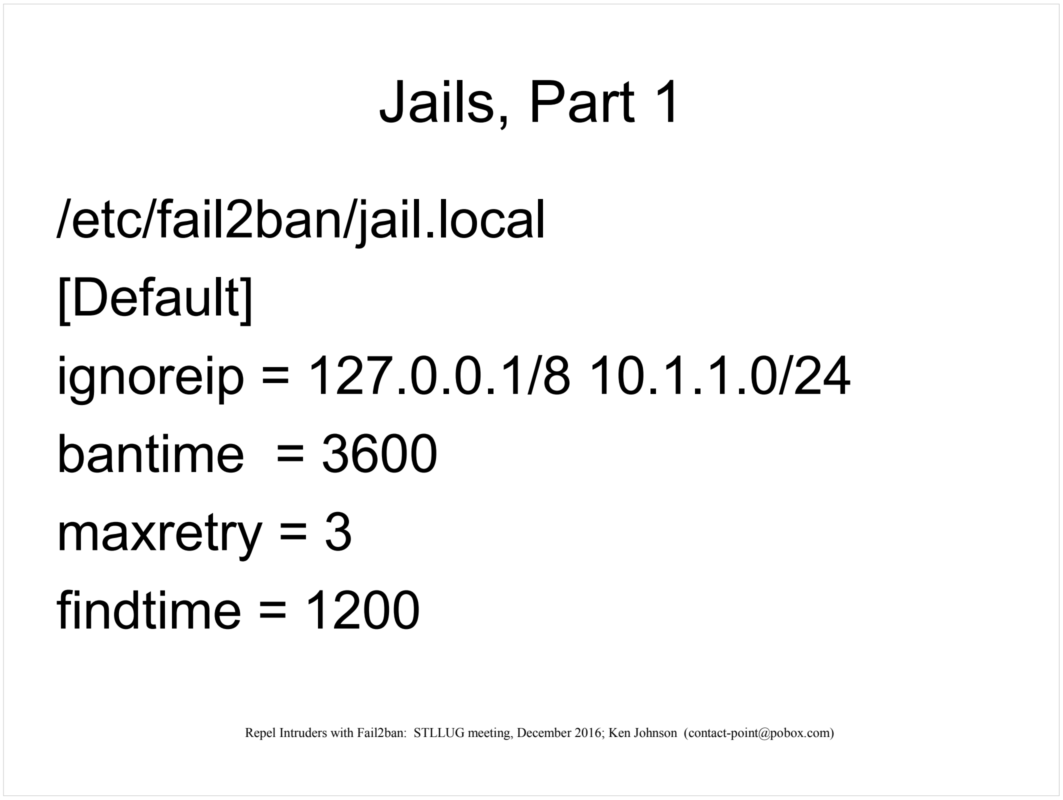
Jails, Filters, and Actions are special Fail2ban terms.

A *Jail* defines where and how to look for repetitive access failures and what to do about them.

A *Filter* contains one or more regular expressions that matches or rejects log file messages to identify unauthorized access attempts.

The default *Action* when a match occurs is to add a drop rule to the iptables chains.

Iptables is a powerful package from netfilter.org that lets you specify match rules and actions on network packets. Iptables is probably installed by default. Fail2ban uses iptables to drop 'hostile' packets.



Jails, Part 1

```
/etc/fail2ban/jail.local
[Default]
ignoreip = 127.0.0.1/8 10.1.1.0/24
bantime  = 3600
maxretry = 3
findtime = 1200
```

A jail defines where and how to look for repetitive access failures and what to do about them. A filter, an action, and some data to make them work.

(Don't confuse this with a chroot or FreeBSD jail)

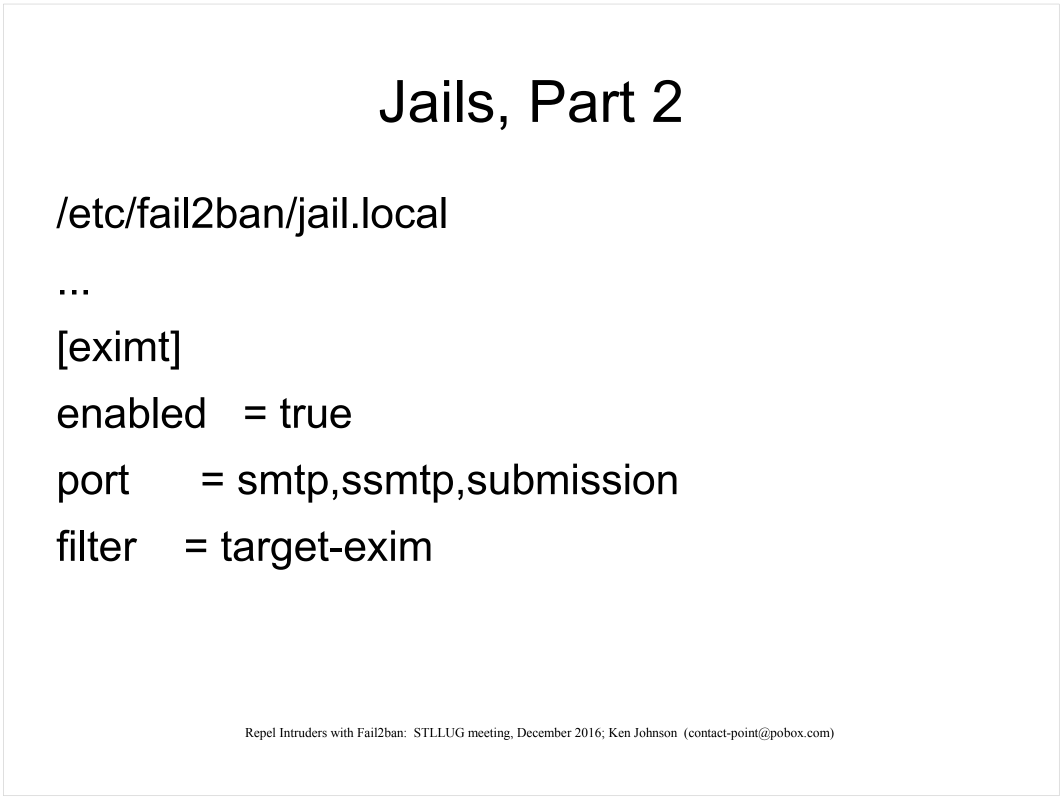
[Default] – use these values if not specified

ignoreip – your local trusted network, if you have one: laptops move, servers do not.

bantime – timer for the drop filter

maxretry – count that triggers filtering

findtime – time window for maxretry



Jails, Part 2

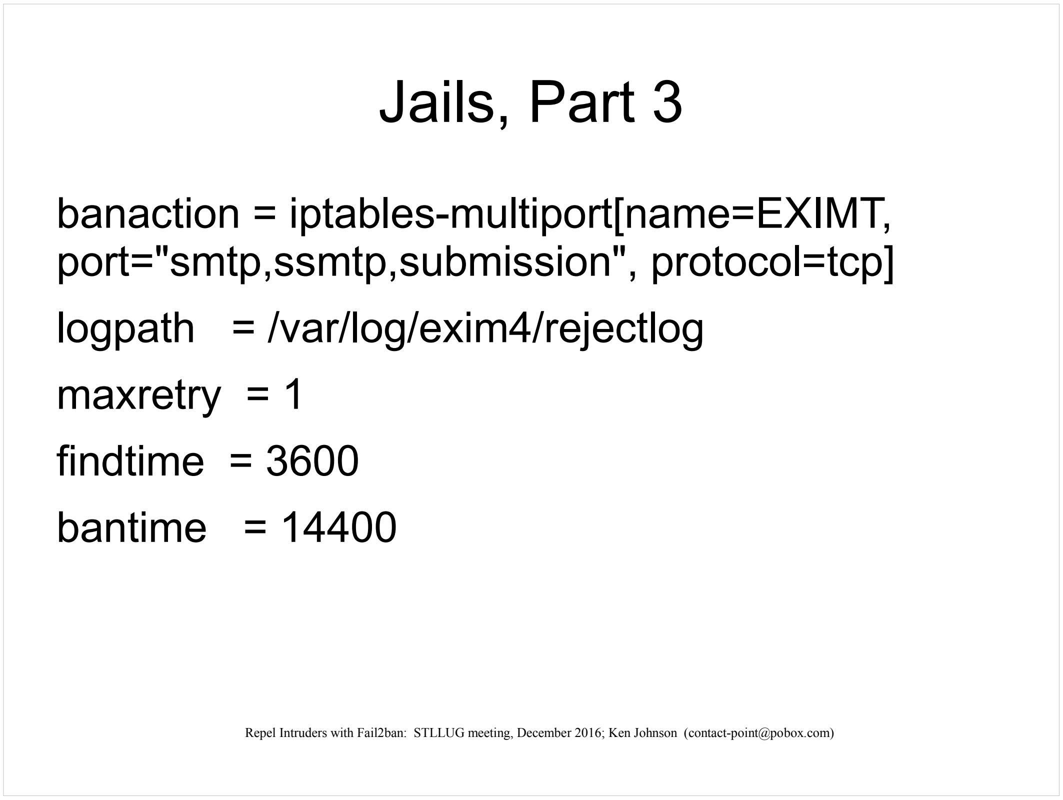
```
/etc/fail2ban/jail.local
...
[eximt]
enabled   = true
port      = smtp,ssmtp,submission
filter    = target-exim
```

This was set up to defend against a set of targeted (often used real usernames) attacks with a particular signature.

Enabled – the obvious

Port – these ports are used in the default ban action

Filter – the file with the regular expression(s)



Jails, Part 3

```
banaction = iptables-multiport[name=EXIMT,
port="smtp,ssmtp,submission", protocol=tcp]
logpath   = /var/log/exim4/rejectlog
maxretry  = 1
findtime  = 3600
bantime   = 14400
```

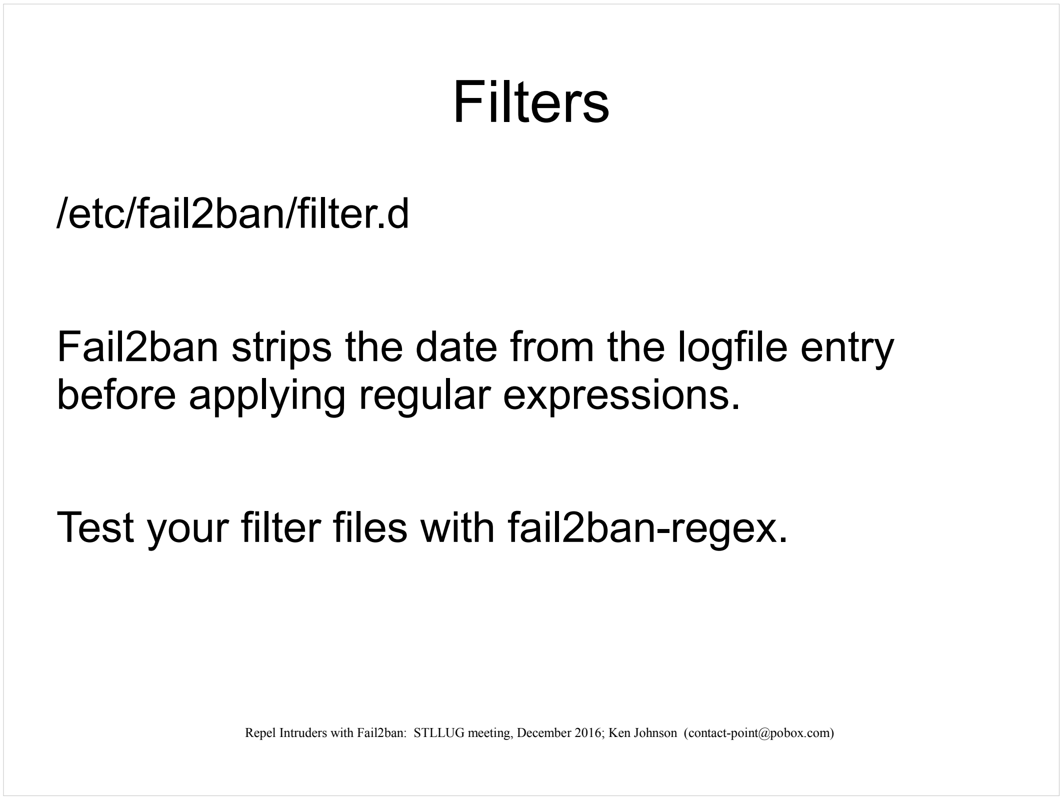
Ban action – do this when an attempt is found

Logpath – the log file to look in

Maxretry – how many matches for an IP address trigger the banaction

Findtime – the window for counting maxretry

Bantime – how long that IP address is dropped; how long before fail2ban removes the the drop rule from iptables (assuming default actions)



Filters

/etc/fail2ban/filter.d

Fail2ban strips the date from the logfile entry before applying regular expressions.

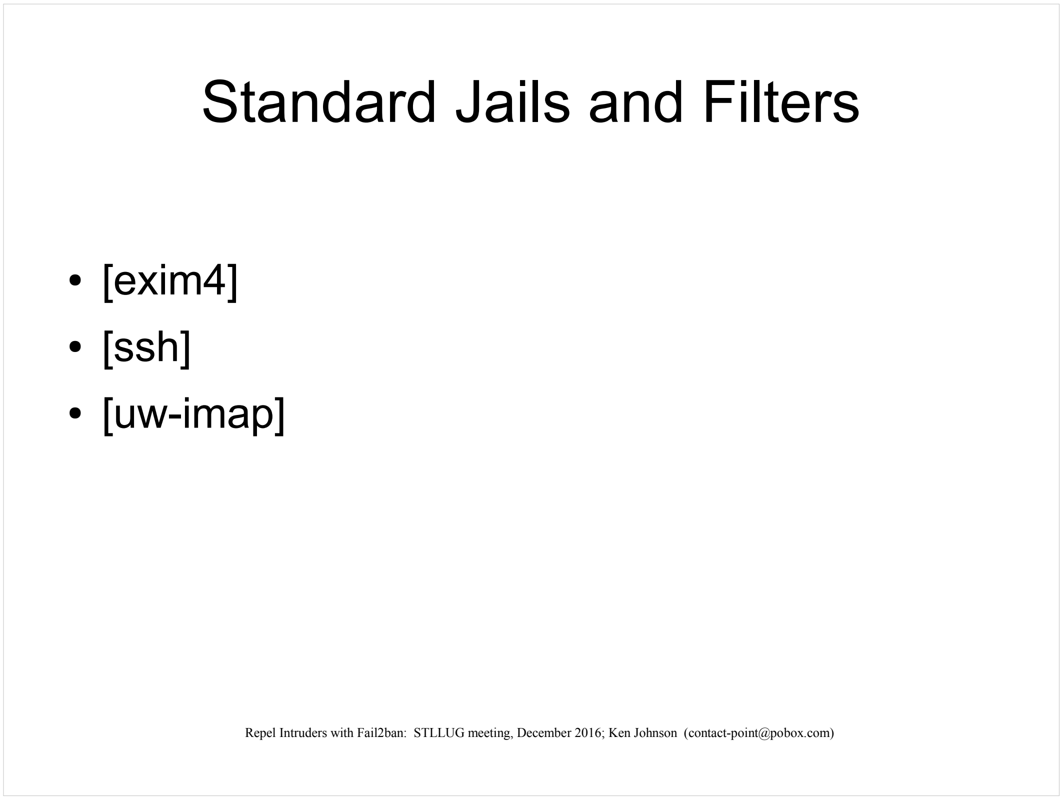
Test your filter files with fail2ban-regex.

A filter is the regular expression (or more than one) that matches or rejects log file messages to identify unauthorized access attempts.

/etc/fail2ban/filter.d

The fail2ban regular expressions work on the logfile entry after the date has been stripped off.

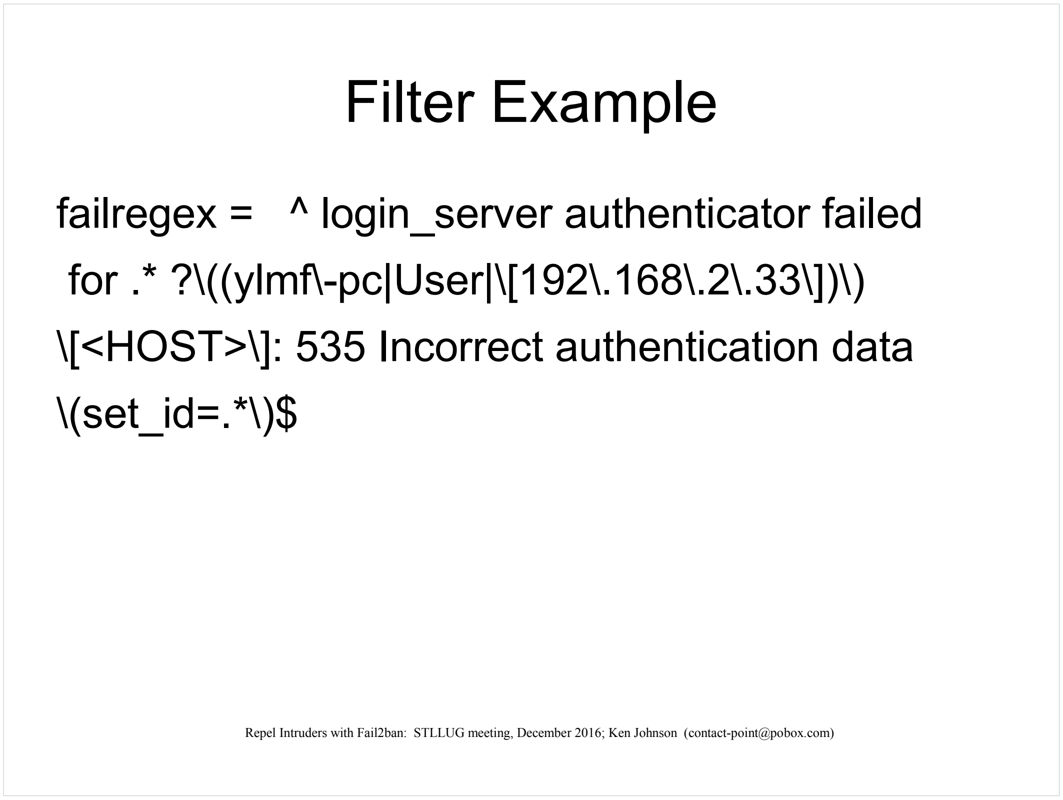
You can test your filter files with fail2ban-regex.



Standard Jails and Filters

- [exim4]
- [ssh]
- [uw-imap]

I used these filters mostly 'out of the box', though it turned out I needed to modify the exim4 filter to match the log message format on the system where I use fail2ban.



Filter Example

```
failregex =   ^ login_server authenticator failed
 for .* ?\((ylmf\-pc|User|\[192\.168\.2\.33\])\)
\[<HOST>\]: 535 Incorrect authentication data
\(set_id=.*\)$
```

The fail2ban regular expressions work on the logfile entry after the date has been stripped off

You can test your filter files with fail2ban-regex

I use regular expressions often enough to create this one, but rarely enough that I keep a copy of 'Mastering Regular Expressions' handy. 2^{Nd} edition is $10 w/ shipping, used.

This is a filter I created when I observed that most targeted (using real usernames) attempts had some common features.

Custom Filters

- [eximt]
- [flag]
- [spam]
- [ssh-root]

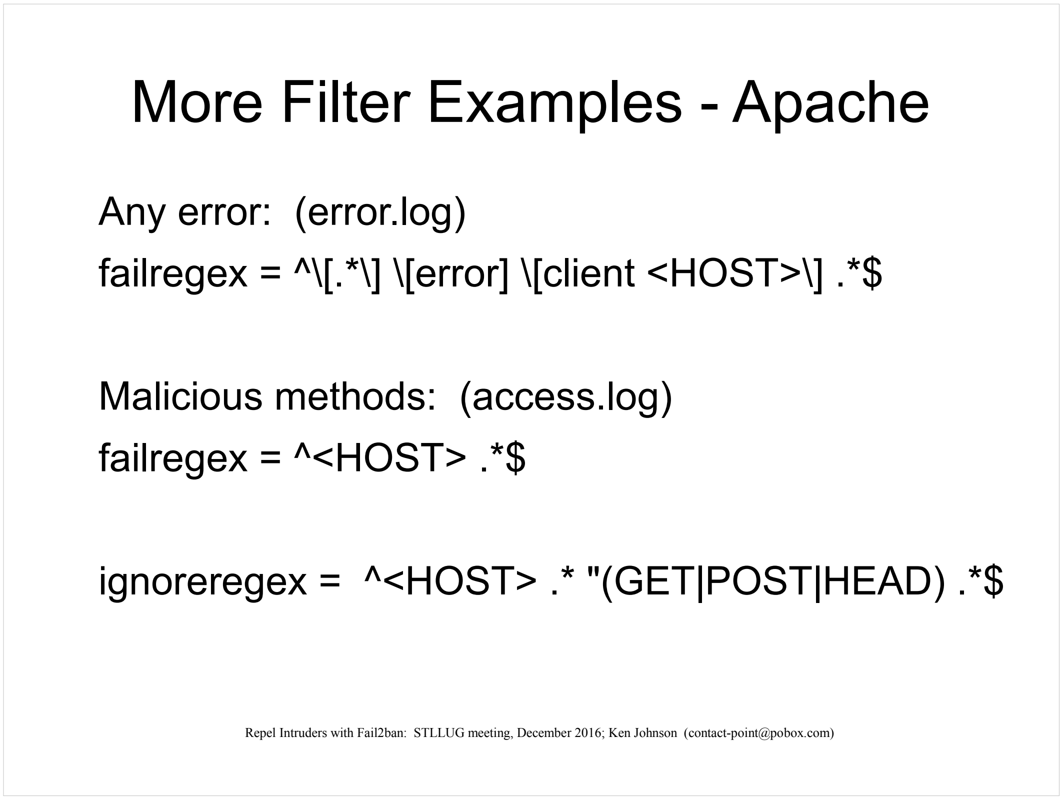
These are custom filters I set up.

Eximt limits many targeted attacks.

Flag filters repetitive senders of flagged email.

Spam filters senders of spam.

Ssh-root filters any attempt to use an account on the deny list.



More Filter Examples - Apache

Any error: (error.log)

```
failregex = ^\[.*\] \[error] \[client <HOST>\] .*$
```

Malicious methods: (access.log)

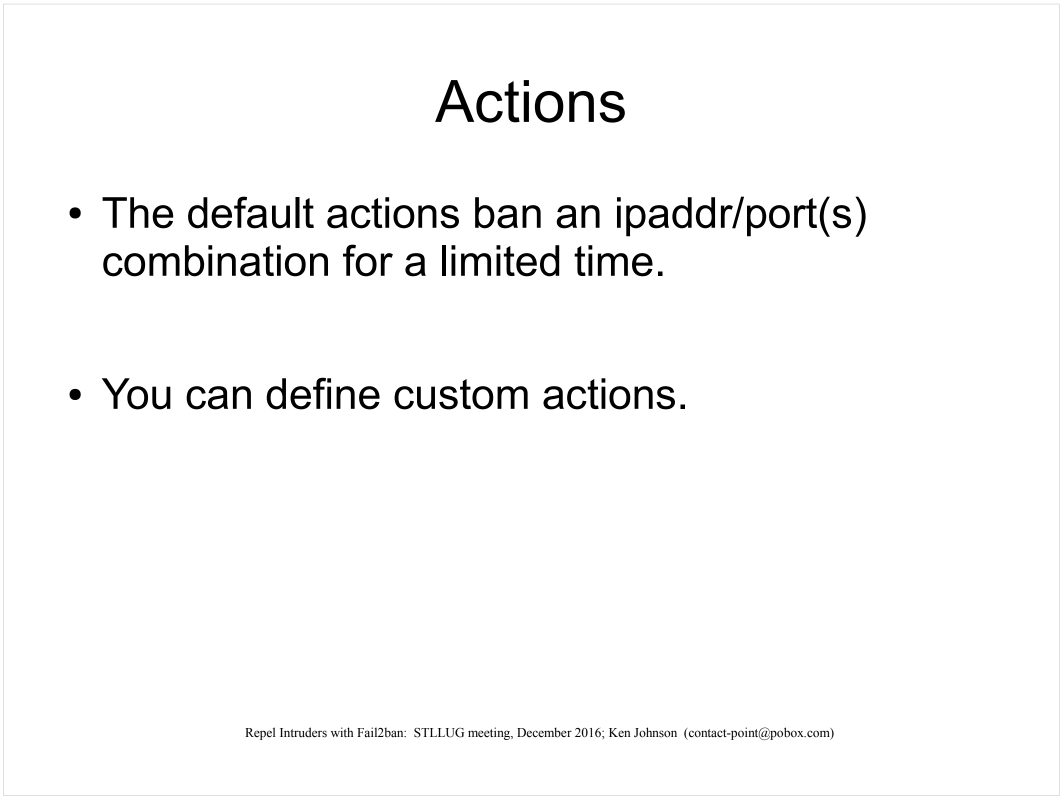
```
failregex = ^<HOST> .*$

ignoreregex =  ^<HOST> .* "(GET|POST|HEAD) .*$
```

Some filters set up for Apache.

Based on log file analysis. No such file excluded from error.log on this server.

Others:

404 – no such file
408 – timeout
OpenVAS
wp-login
xmlrpc

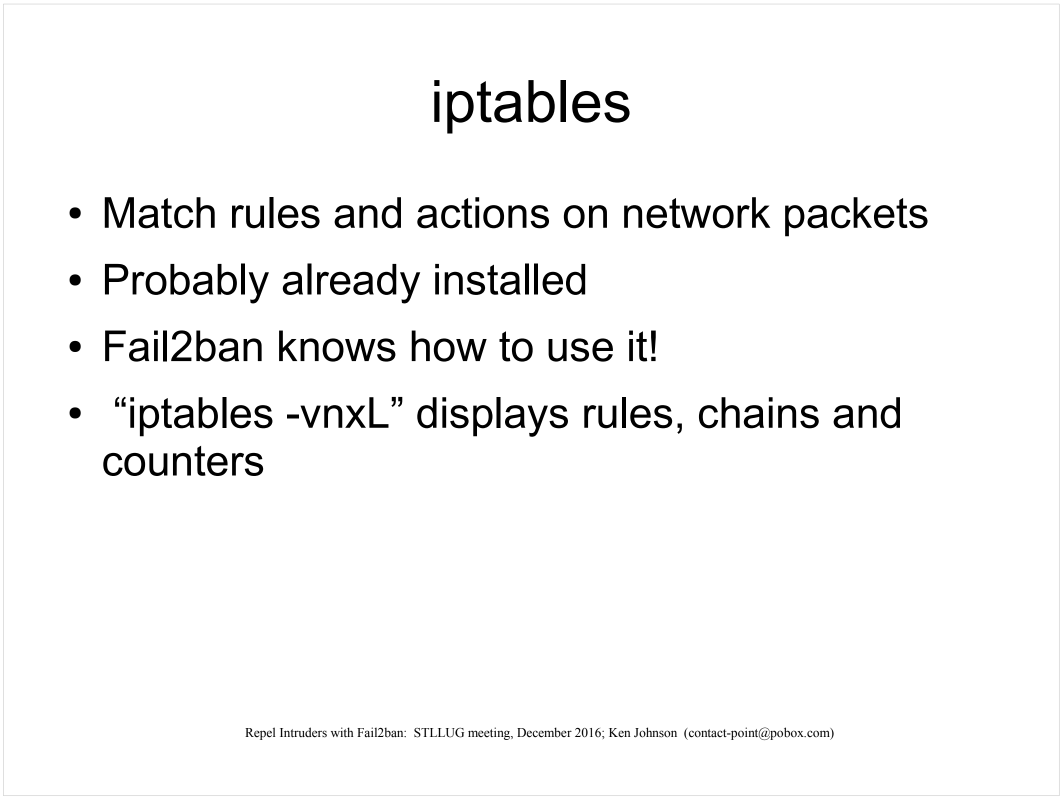


Actions

- The default actions ban an ipaddr/port(s) combination for a limited time.
- You can define custom actions.

The default action when a match occurs is to add a drop rule to the iptables chains. You can define your own actions.

Iptables is a powerful package from netfilter.org that lets you specify match rules and actions on network packets. Iptables is probably installed by default. Fail2ban uses iptables to drop 'hostile' packets.



iptables

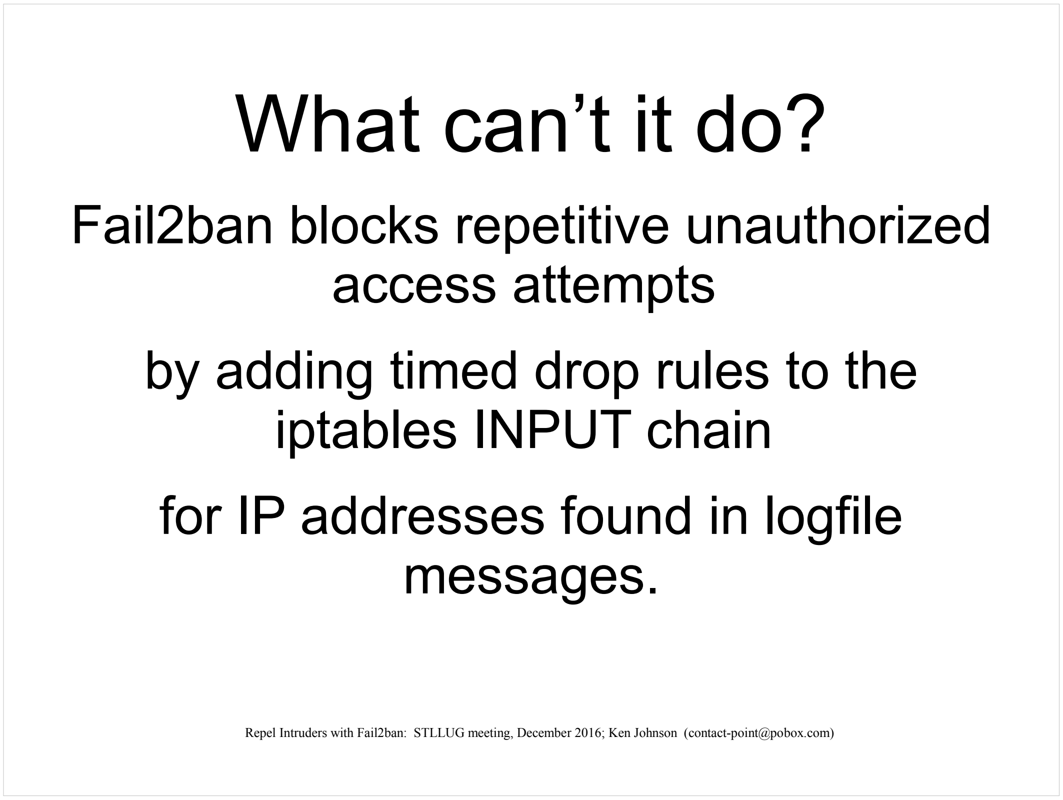
- Match rules and actions on network packets
- Probably already installed
- Fail2ban knows how to use it!
- “iptables -vnxL” displays rules, chains and counters

Iptables is a powerful package from netfilter.org that lets you specify match rules and actions on network packets. Iptables is probably installed by default. Fail2ban uses iptables to drop 'hostile' packets.

How do you get it?

- aptitude update
- aptitude install fail2ban

- … or the equivalent on your system



What can’t it do?

Fail2ban blocks repetitive unauthorized access attempts

by adding timed drop rules to the iptables INPUT chain

for IP addresses found in logfile messages.

Fail2ban does not:

stop distributed attacks that use each zombie only once;

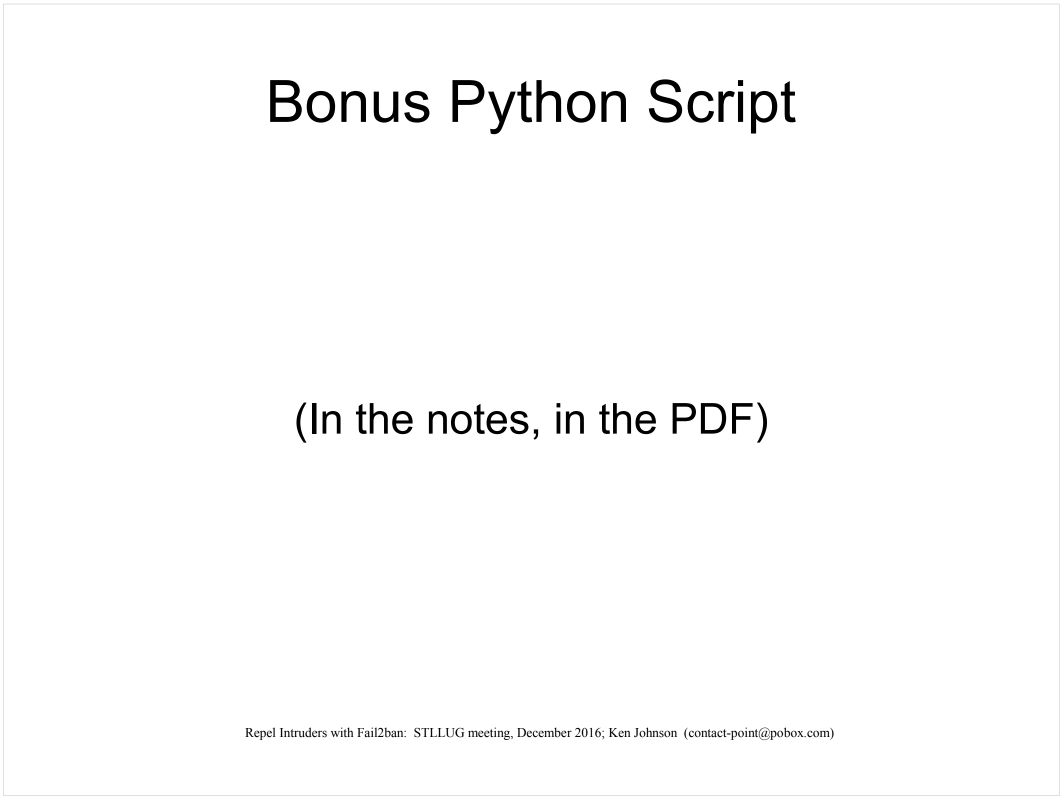
help if you are working in a virtual server without iptables, or you haven’t got root;

help if the logfile message does not include an IP address.

Results (uptime 30 days)

Linux2:/etc/cron.daily# iptables -vnxL | /etc/cron.daily/f2bcounts.py

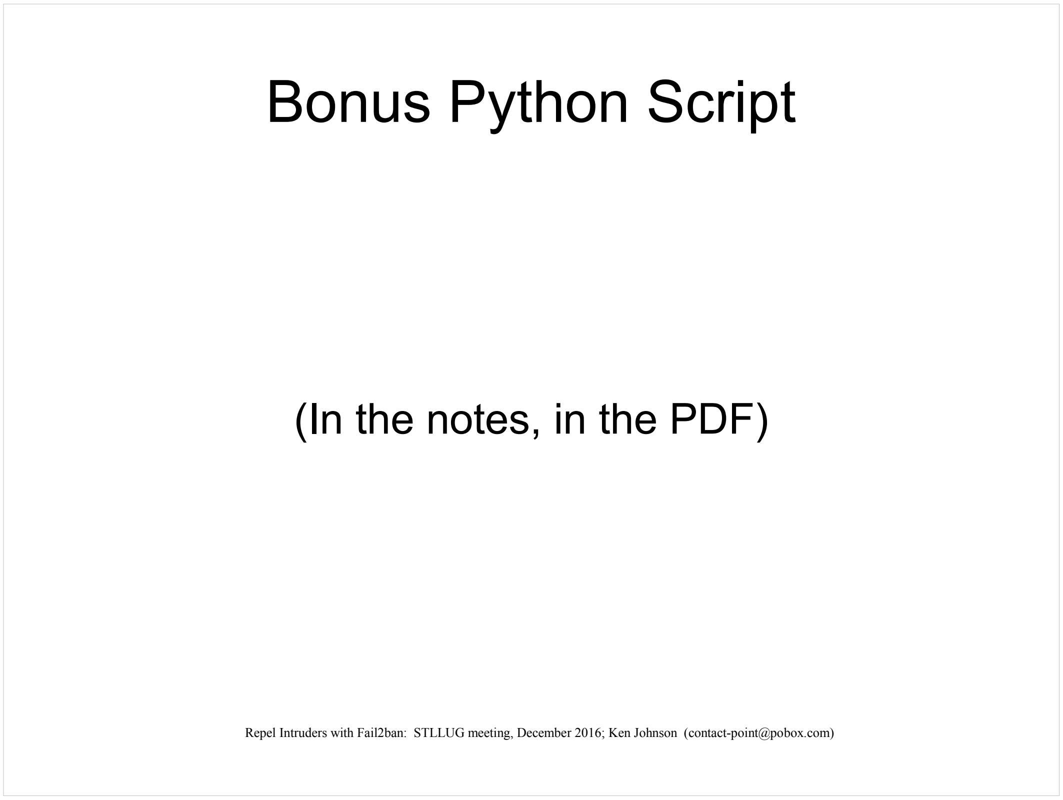
- ('Filter/Jail', 'Pkts', 'Bytes')
- ('fail2ban-FLAG', 2016, 192078L)
- ('fail2ban-SPAM', 33849, 1789535L)
- ('fail2ban-EXIM4', 9706, 464767L)
- ('fail2ban-UW-IMAP', 21264, 1055070)
- ('fail2ban-EXIMT', 1120, 61914L)
- ('fail2ban-ssh-root', 1448, 127360L)
- ('fail2ban-ssh', 0, 0L)
- ('TOTALS', 69403, 3690724L)



Bonus Python Script

(In the notes, in the PDF)

```
# copyright Ken Johnson, 2014
# This is free software; you can redistribute it and/or modify it under
# the terms of version 2 of the GNU General Public License as
# published by the Free Software Foundation.

# This software is distributed in the hope that it will be useful, but
# WITHOUT ANY WARRANTY;without even the implied warranty of
# MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

# The INPUT chain is the one we care about.  Packets work down the
# chain until accepted or dropped.  The fail2ban rules are jump rules,
# that is, matching packets jump to the named chain.  If they match
# a rule in that named chain, they are dropped.  Otherwise, they return
# to the next rule in the INPUT chain.  So, to find out how many packets
# are dropped by a f2b rule, subtract the returned packet count of the
# f2b chain from the match packet count shown for that f2b rule in the
# INPUT chain.

import fileinput

seenChainINPUT = False
seenChainFORWARD = False
getReturnCount = False
chain = ""
beforeList = []
afterList = []
totPkts = 0
totBytes = 0
```



Bonus Python Script

(In the notes, in the PDF)

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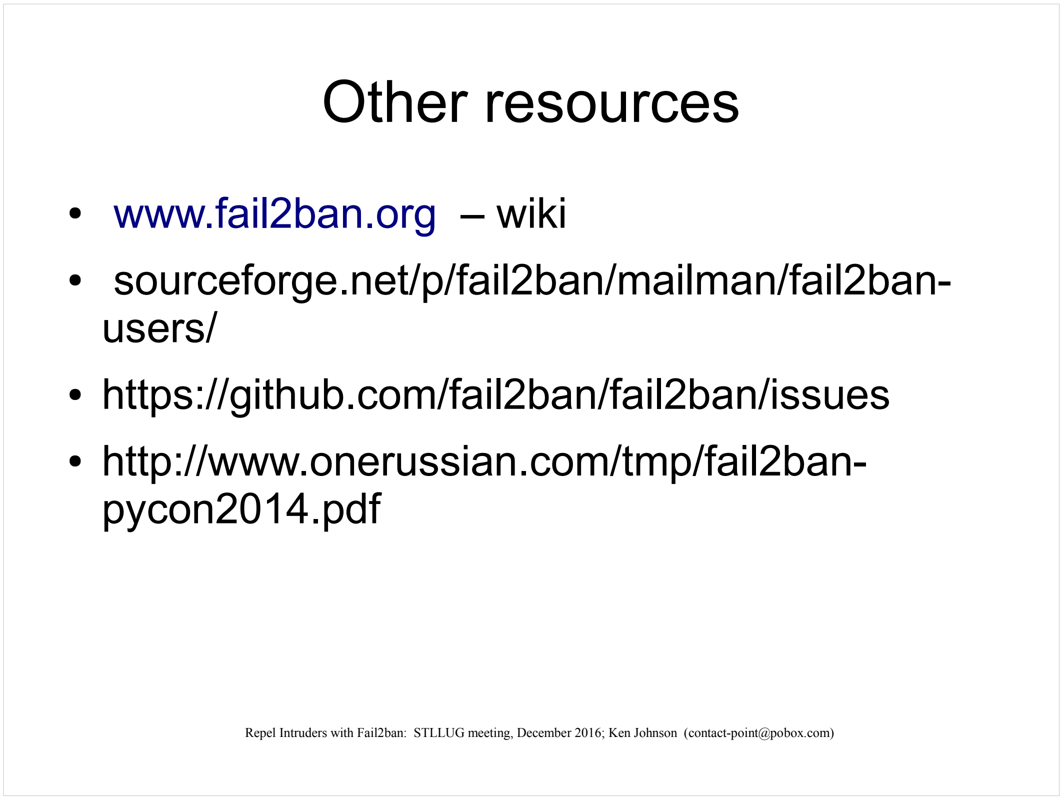
```
for line in fileinput.input():
  if not seenChainINPUT:
    if "Chain INPUT" in line:
      seenChainINPUT = True

  elif not seenChainFORWARD:
    if "Chain FORWARD" in line:
      seenChainFORWARD = True

    elif "fail2ban-" in line:
      slist = line.split()
      beforeList.append((slist[2], slist[0], slist[1]))

  elif "Chain fail2ban-" in line:
    slist = line.split()
    chain = slist[1]

  elif "RETURN" in line:
    slist = line.split()
    afterList.append((chain, slist[0], slist[1]))

for bsl in beforeList:
  for asl in afterList:
    if bsl[0] == asl[0]:
      print (bsl[0], int(bsl[1])-int(asl[1]), int(bsl[2])-int(asl[2]))
      totPkts = totPkts + int(bsl[1])-int(asl[1])
      totBytes = totBytes + int(bsl[2])-int(asl[2])
print ("TOTALS", totPkts, totBytes)
```



Other resources

- www.fail2ban.org – wiki
- sourceforge.net/p/fail2ban/mailman/fail2ban-users/
- https://github.com/fail2ban/fail2ban/issues
- http://www.onerussian.com/tmp/fail2ban-pycon2014.pdf

Wiki

Mailing list

Issue tracker

Presentation at Pycon

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