BGP Flowspec

April 2008

Agenda

- The problem
- What is Flowspec?
- Components
- Validation
- What can we do with it?
- Junos Configuration

The problem

- Service Providers are being driven to detect and mitigate denial of service attacks destined towards key customers
  - Stop bad traffic from reaching customer
- Service Providers also want to
  - Stop bad traffic consuming resources on expensive transit links
  - Be able to position as a value add to customer

Layered solution

- CPE protection
  - Customer has UTM/DI/IDP
  - Granular inspection of every packet
- Provider upstream edge detection/blocking
  - Analysis of flow information
  - Dynamic filters applied to rate limit, block or redirect specific attack traffic
  - Eliminate human error or delay associated with traditional access list mitigation
- Centralised cleaning solution
  - Value add for customer that doesn’t have deep inspection capability
  - Forensic analysis / packet capture

BGP Flowspec

- Use BGP to distribute flow specification filter and dynamically filter on routers
  - Introduced in Junos 7.2
  - New BGP NLRI address family
  - Use extended communities to specify action (accept, discard, rate-limit, sample, redirect)
  - Match on a combination of source/dest prefix, source/dest port, ICMP type/code, pack size, DSCP, TCP flag, fragment encoding etc.

What is BGP Flow-Spec

- RFC 5575 - Dissemination of Flow Specification Rules

- Defines a method for the originator of a BGP NLRI to define and advertise a flow filter to its peers via BGP.

- Multi vendor support
    - Co-authored with Cisco, Arbor, NTT/Verio
- Authors:
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    - Danny McPherson
    - Robert Raszuk
    - Barry Greene
    - Pedro Marques
    - Nischal Sheth

What is BGP Flow-Spec

- Defines a way to carry “flow” in BGP
  - New Address family for BGP
    - NLRI type (afi=1, safi=133)
- Defines operations to perform on flows
  - Sends an “action” in a BGP Update
- Defines a Model for Validation

Address family identifier / sub address family indicator

Component Types

- T1 Destination Address
- T2 Source Address
- T3 IP Protocol
- T4 Port (source or dest)
- T5 Destination port
- T6 Source Port
- T7 ICMP type
- T8 ICMP code
- T9 TCP flags
- T10 Packet length
- T11 DSCP
- T12 Fragment Encoding

Actions

- Carried as extended BGP communities
- Type 0x8006 Traffic-Rate
- Type 0x8007 Traffic-Action
  - Bit 0 Action set to “action or not “ (filter or not)
  - Bit 1 Sample log the packets
- Type 0x8008 Redirect
  - Send traffic to another VRF for collection

Flow Validation

- Need to validate by default to prevent spoofing

- Rules

  a) The "originator" of a flow route matches the "originator" of the best match unicast route for the destination address that is embedded in the route.

  b) There are no more-specific unicast routes, when compared to destination address of the flow route, for which the active route has been received from a different next-hop autonomous-system.

Disabling Validation

- Validate against a policy

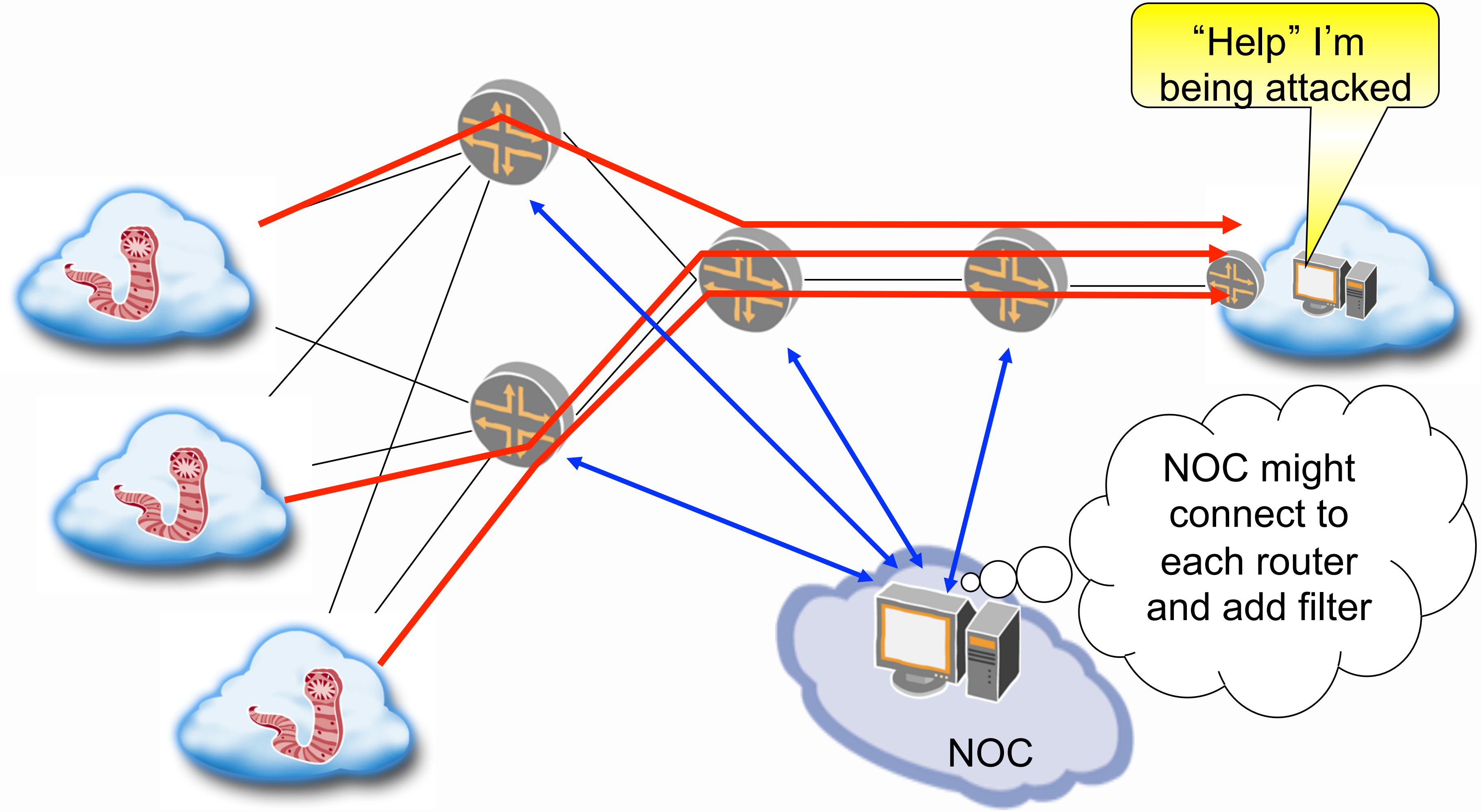
```
family inet {
    flow {
   no-validate <policy>; "Validation procedure is skipped
   for
                          routes that match this policy";
    }
}
```

What can we do with it

- Allows Customers to set their own firewalls on SP core.
  - Validation rules will avoid spoofing of flow NLRI

- Provides a tool for the NOC to quickly react to DDOS attacks.

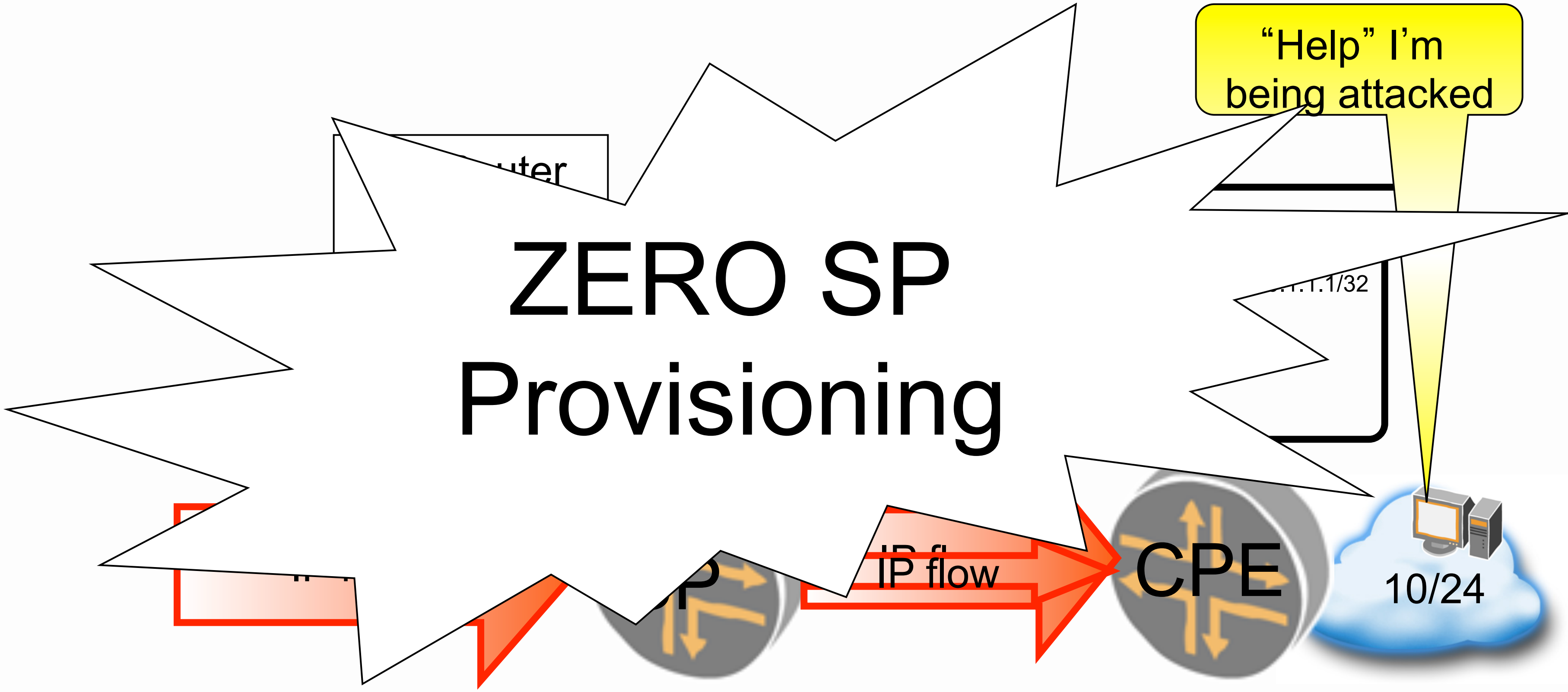
Distributed DOS attack
In the "old" days



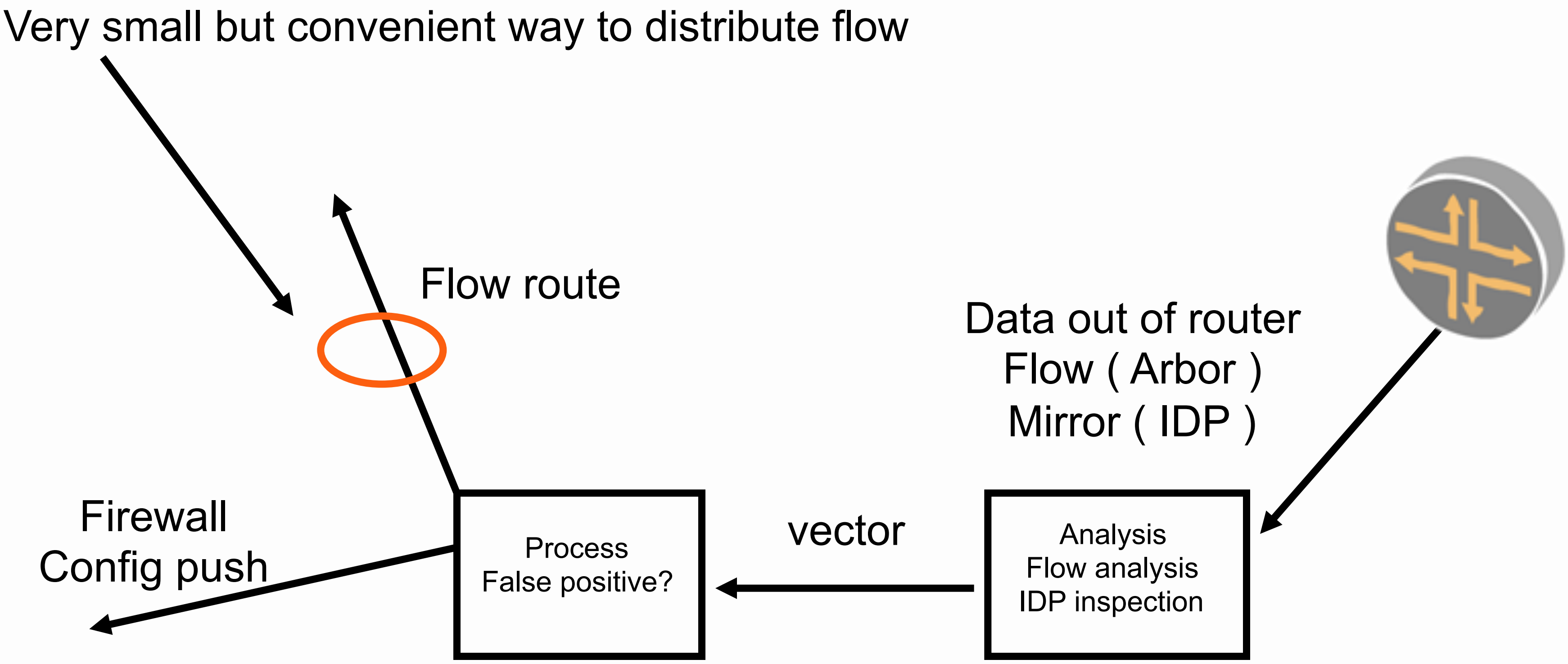
"Help" I'm being attacked
NOC might connect to each router and add filter
NOC

The General Concept – micro view

- CPE can now react to a DOS attack



In model for monitoring, flow is small part of picture



Very small but convenient way to distribute flow

Flow route

Data out of router
Flow (Arbor)
Mirror (IDP)

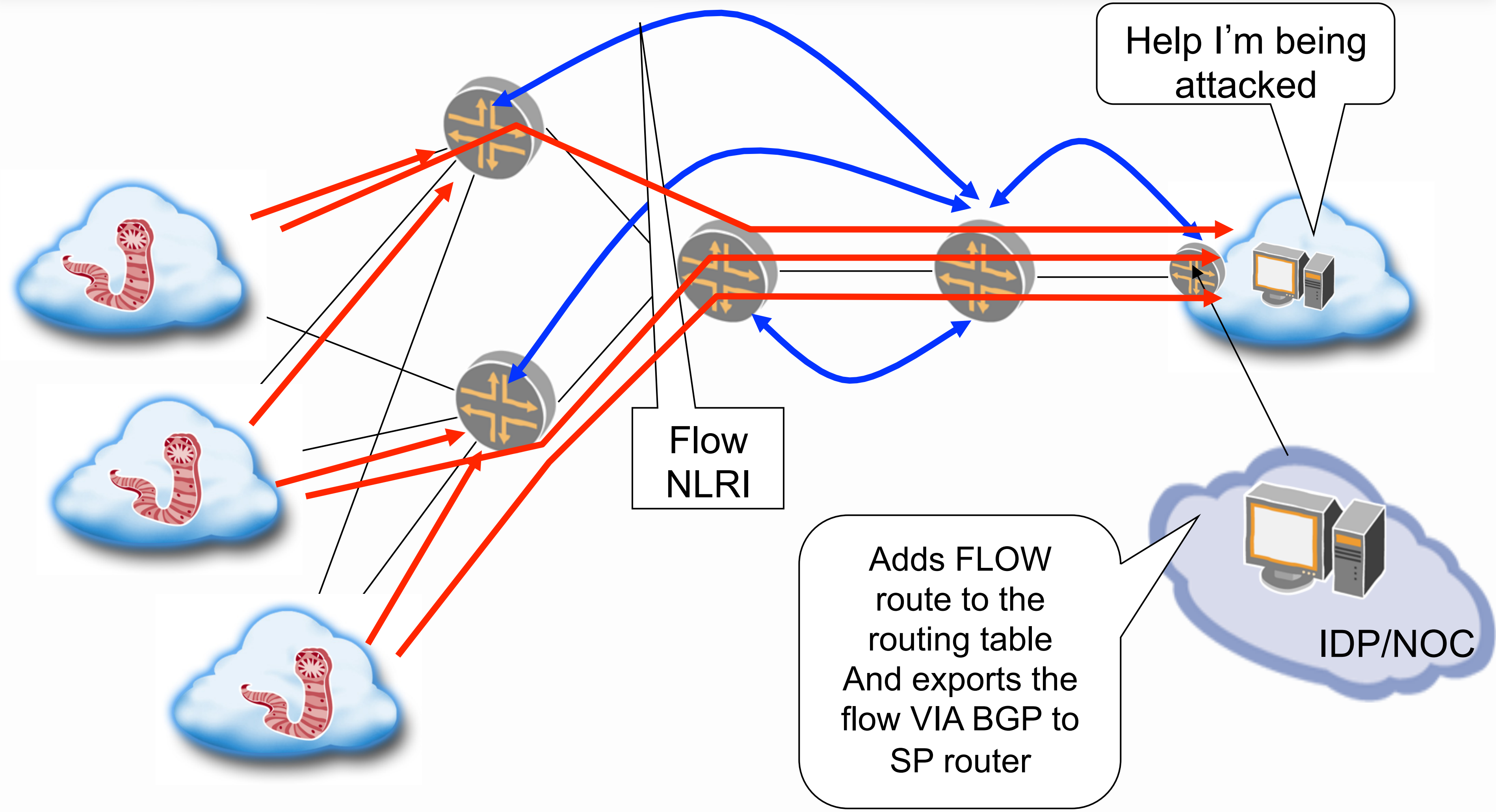
Firewall
Config push

Process
False positive?

vector

Analysis
Flow analysis
IDP inspection

Distributed DOS attack CPE Controlled



Help I'm being attacked

Flow NLRI

Adds FLOW route to the routing table And exports the flow VIA BGP to SP router

Comparisons with current filtering methods

- Many SP's already use prefix based filters
  - Match on community
  - Set next-hop discard
  - ONLY works for destination prefix
- Flow adds granularity to this
  - Match on components
    - SA / DA / Proto / length..
  - Don't have to discard
    - Rate limit
    - Sample
    - Forwarding-class

Configuration Options Define FLOW

```
routing-options {
    flow {
       route <name> {
           match {
                  destination;
                  source ;
                  protocol ;
                  port ;
                  destination-port ;
                  source-port ;
                  icmp-code ;
                  icmp-type ;
                  tcp-flags ;
                  packet-length ;
                  dscp ;
                  fragment [
                      dont-fragment
                      not-a-fragment
                      is-fragment
                      first-fragment
                      last-fragment
                  ]
           }
```

```
then {
                        accept;
                                   discard;
                                   next-term;
                                   rate-limit;
                                   sample;
                                   routing-instance;
                     }
                  }
   }
}

[edit protocols bgp]
group <name> {
   family inet flow;

   neighbor <a.b.c.d> {
                  family inet flow;
   }
}
```

Configuration Example Routing Options

- Define Flow routes

```
routing-options {
    flow {
      route filter {
         match destination 192.168.21.0/24;
         then {
            community test;
            rate-limit 32k;
         }
      }
   }
}
```

Configuration example BGP

- Add family flow to BGP peers

```
Protocols {
    bgp {
        group int {
            type internal;
            local-address 20.2.2.2;
               family inet {
                   unicast;
                   flow; <<<
             }
  neighbor 20.3.3.3;
}
```

Configuration example

- Define Non-Validation

```
show protocols bgp group int {
    type internal;
    local-address 20.3.3.3;
    family inet {
        unicast;
        flow {
            no-validate test;
        }
    }
    neighbor 20.2.2.2;
}
```

Diagnostics

- show route receive-protocol bgp
  - Shows received NLRI
- show route advertising-protocol bgp
  - Shows advertised NLRI
- show route flow
  - show active flow routes
- show route table inetflow.0
  - Shows actual defined flow routes (from routing options)
- show firewall
  - Shows installed flow filters and counters

Show Firewall

```
lab@Darstardly-re0# run show firewall



Counters:
Name                                  Bytes         Packets
192.168.21/24,*                        28672        112
Policers:
Name                                 Packets
192.168.21/24,*                          112

[edit]
lab@Darstardly-re0#
```

Who’s using it

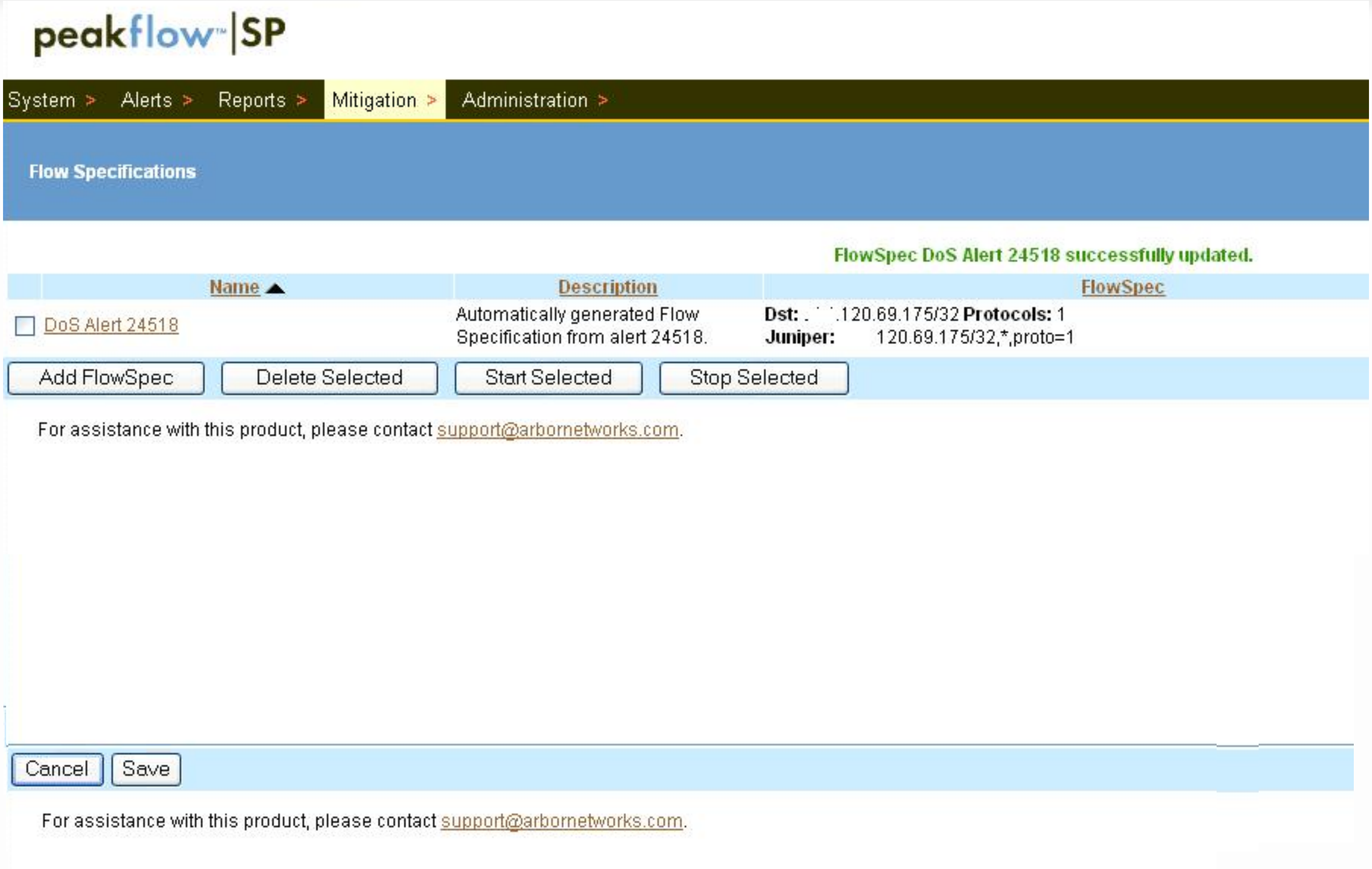
- Internet 2
- TimeWarner
- others looking into it
  - Dozens !

Big Motivation is VoIP

Common questions

- Spoofing
  - Validation will prevent this
- Why BGP
  - Its there
- What's stopped auto configuration efforts in the past?
  - AS boundaries
  - NO tools that work
    - Configure >100 routers in seconds “Danny McPherson”

Arbor BGP flowspec integration



Flow Specifications

FlowSpec DoS Alert 24518 successfully updated.

	Name ▲	Description	FlowSpec
□	DoS Alert 24518	Automatically generated Flow Specification from alert 24518.	**Dst:** .120.69.175/32 **Protocols:** 1 **Juniper:** 120.69.175/32,*,proto=1

For assistance with this product, please contact support@arbornetworks.com.

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Things to think about…

- Propagation of filters to SP peers?
- Use in lawful intercept?

References

- http://www.nanog.org/mtg-0610/lozano.html
- http://tools.ietf.org/id/draft-marques-idr-flow-spec-04.txt
- http://www.ietf.org/proceedings/07jul/slides/idr-0.pdf