

Development of a Snort IPv6 Plugin

– Detection of Attacks on the Neighbor Discovery Protocol –

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IPv6 Security Issues

- ▶ Main IPv6 RFCs from 1995/1998,
⇒ IPv6 has to catch up with 15 years IPv4 security experience
- ▶ Many accompanying RFCs and Internet Drafts (IPsec, SEND, RH0 deprecation ...)
- ▶ Few implementations
- ▶ Even fewer in deployed end user devices
- ▶ Documented attacks against Neighbor Discovery Protocol and IPv6 implementations (e. g. THC Toolkit)

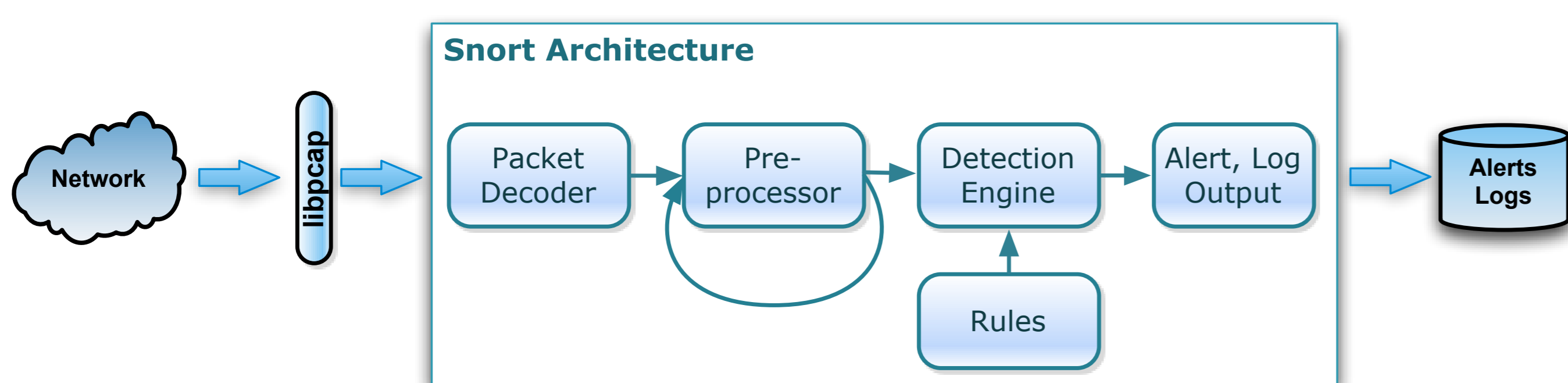
Snort IDS

- ▶ Widely used Open Source NIDS
- ▶ Filter/inline mode
(*Intrusion Prevention System*)
- ▶ Decoder for common tunnel protocols
- ▶ Plugin APIs for processing stages
- ▶ Extensible with 3rd party preprocessors, options and rules



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Schematic data flow in the Snort IDS



IPv6 Preprocessor

Simple configuration in `snort.conf`, for example:

```
preprocessor ipv6: \
  net_prefix 2001:0db8:1::/64 2001:0db8:2::/64 \
  router_mac 00:16:76:03:bd:92
```

Added Snort functionality:

- ▶ Reads ICMPv6 messages
- ▶ Follows network state, i. e. logs (MAC, IP) of:
 - ▶ On-link routers
 - ▶ On-link hosts
 - ▶ Ongoing DADs
- ▶ Alerts on new/unknown hosts and routers

IPv6 Preprocessor Alerts

SID: Log Message:

- 1 RA from new router
- 2 RA from non-router MAC address
- 3 RA prefix changed
- 4 RA flags changed
- 5 RA for non-local network address prefix
- 6 RA with lifetime of 0
- 7 new DAD started
- 8 new host in network
- 9 new host with non-allowed MAC address
- 10 DAD with collision
- 11 DAD with spoofed collision
- 12 mismatch in MAC/NDP source link-layer address
- 13 extension header contains only padding
- 14 option lengths \neq extension header length
- 15 padding option contains data \neq zero
- 16 multiple consecutive padding options

New IPv6 Rule Options

- ▶ Make all IPv6 fields accessible for Snort signatures:
Basic Header, Extension Headers, Neighbor Discovery Options
- ▶ Take literal values and comparison operations
- ▶ Return `match/no_match`
- ▶ To be used as part of more complex attack signatures

Option: Tests:

| | |
|------------------------------|--------------------------------------|
| <code>ipv</code> | IP version |
| <code>ip6_tclass</code> | Traffic Class |
| <code>ip6_flow</code> | Flow Label |
| <code>ip6_exthdr</code> | Extension Header Type |
| <code>ip6_extnum</code> | Number of Extension Headers |
| <code>ip6_option</code> | Destination-/Hop-by-Hop-Option Type |
| <code>ip6_optval</code> | Destination-/Hop-by-Hop-Option Value |
| <code>ip6_rh</code> | Routing Header Type |
| <code>icmp6_nd</code> | If NDP packet |
| <code>icmp6_nd_option</code> | NDP Option Type |

New Signature Example

```
alert icmp any any -> any any ( \
  ipv: 4; itype: 3; \
  msg: "ICMPv4 dest unreachable"; \
  sid: 1000002; rev: 1;)
```

```
alert icmp any any -> any any ( \
  ipv: 6; itype: 3; \
  msg: "ICMPv6 time exceeded"; \
  sid: 1000003; rev: 1;)
```

These Snort signatures use the `ipv` option for IP protocol distinction. A normal Snort configuration provides only the `itype` option and is not able to distinguish these events.

Conclusion

- ▶ Successfully tested against our network traffic
- ▶ Dynamic library (installs without Snort recompilation)
- ▶ Basis for new signatures
- ▶ Good performance
- ▶ Snort & IPv6-Plugin detects THC attacks

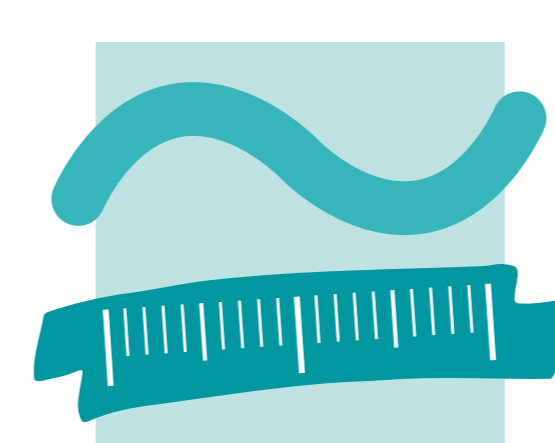
Contact Info

Project Homepage:
<http://ipv6-ids.de/>
Software Repository:

http://github.com/mschuett/spp_ipv6



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