Development of a Snort IPv6 Plugin

– Detection of Attacks on the Neighbor Discovery Protocol

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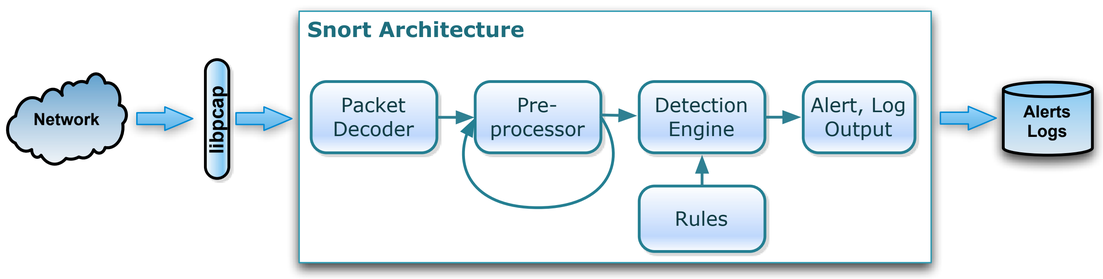
IPv6 Security Issues

- 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

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 ≠ extension header length
15	padding option contains data ≠ 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:
`ipv`	IP version
`ip6_tclass`	Traffic Class
`ip6_flow`	Flow Label
`ip6_exthdr`	Extension Header Type
`ip6_extnum`	Number of Extension Headers
`ip6_option`	Destination-/Hop-by-Hop-Option Type
`ip6_optval`	Destination-/Hop-by-Hop-Option Value
`ip6_rh`	Routing Header Type
`icmp6_nd`	If NDP packet
`icmp6_nd_option`	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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