# Exercise: Analyse a tcpdump of a DNS lookup

* What hostname is being used in the dig query, and what sort of RR is it looking for?

A? www.massey.ac.nz. ar

* What is 192.58.128.30?

Root server j

* In responses, you sometimes see three numbers like 1/2/3. What does this represent?
* Draw and annotate the DNS exchanges that are going on.
  + Part of the exchange involves verifying DNS key signing. This relates to RR of DS and DNSKEY. Related to this are type50 and RRSIG RRs. Don't worry about that part of the exchange.
* Why were some queries repeated using TCP?

# tcpdump -ni em1 -s 0 -vvv port 53

tcpdump: listening on em1, link-type EN10MB (Ethernet), capture size 65535 bytes

## 16:0616:06:08.161301 IP (tos 0x0, ttl 64, id 8173, offset 0, flags [none], proto UDP (17), length 73)

**146.176.166.1.41354** > **192.58.128.30.domain**: [bad udp cksum 0x7951 -> 0xa520!] 26874% [1au] A? www.massey.ac.nz. ar: . OPT UDPsize=512 OK (45)

## 16:0616:0616:0616:06:08.161456 IP (tos 0x0, ttl 64, id 8174, offset 0, flags [none], proto UDP (17), length 56)

**146.176.166.1.45067** > **192.58.128.30.domain**: [bad udp cksum 0x7940 -> 0xe3cd!] 27985% [1au] NS? . ar: . OPT UDPsize=512 OK (28)

## 16:0616:0616:0616:06:08.192543 IP (tos 0x0, ttl 49, id 22189, offset 0, flags [none], proto UDP (17), length 56)

**192.58.128.30.domain** > **146.176.166.1.45067**: [udp sum ok] 27985\*-| q: NS? . 0/0/1 ar: . OPT UDPsize=1472 OK (28)

## 16:0616:0616:0616:06:08.192583 IP (tos 0x0, ttl 49, id 22188, offset 0, flags [none], proto UDP (17), length 207)

**192.58.128.30.domain** > **146.176.166.1.41354**: [udp sum ok] 26874-| q: A? www.massey.ac.nz. 0/7/1 ns: nz. [2d] NS ns1.dns.net.nz., nz. [2d] NS ns2.dns.net.nz., nz. [2d] NS ns3.dns.net.nz., nz. [2d] NS ns4.dns.net.nz., nz. [2d] NS ns5.dns.net.nz., nz. [2d] NS ns6.dns.net.nz., nz. [2d] NS ns7.dns.net.nz. ar: . OPT UDPsize=1472 OK (179)

## 16:0616:0616:0616:06:08.192922 IP (tos 0x0, ttl 64, id 36847, offset 0, flags [DF], proto TCP (6), length 60)

**146.176.166.1.46534** > **192.58.128.30.domain**: Flags [S], cksum 0x7939 (incorrect -> 0x5918), seq 1051387628, win 29200, options [mss 1460,sackOK,TS val 3208014083 ecr 0,nop,wscale 7], length 0

## 16:0616:0616:0616:06:08.192943 IP (tos 0x0, ttl 64, id 44906, offset 0, flags [DF], proto TCP (6), length 60)

**146.176.166.1.57104** > **192.58.128.30.domain**: Flags [S], cksum 0x7939 (incorrect -> 0xf5e9), seq 2568078953, win 29200, options [mss 1460,sackOK,TS val 3208014083 ecr 0,nop,wscale 7], length 0

## 16:0616:0616:0616:06:08.223795 IP (tos 0x0, ttl 49, id 0, offset 0, flags [DF], proto TCP (6), length 60)

**192.58.128.30.domain** > **146.176.166.1.46534**: Flags [S.], cksum 0xccab (correct), seq 2799762111, ack 1051387629, win 14480, options [mss 1380,sackOK,TS val 3356187775 ecr 3208014083,nop,wscale 7], length 0

## 16:0616:0616:0616:06:08.223864 IP (tos 0x0, ttl 64, id 36848, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.46534** > **192.58.128.30.domain**: Flags [.], cksum 0x7931 (incorrect -> 0x32b4), seq 1, ack 1, win 229, options [nop,nop,TS val 3208014114 ecr 3356187775], length 0

## 16:0616:06:08.223871 IP (tos 0x0, ttl 49, id 0, offset 0, flags [DF], proto TCP (6), length 60)

**192.58.128.30.domain** > **146.176.166.1.57104**: Flags [S.], cksum 0xdd9f (correct), seq 2348917116, ack 2568078954, win 14480, options [mss 1380,sackOK,TS val 3356187775 ecr 3208014083,nop,wscale 7], length 0

## 16:0616:06:08.223889 IP (tos 0x0, ttl 64, id 44907, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.57104** > **192.58.128.30.domain**: Flags [.], cksum 0x7931 (incorrect -> 0x43a8), seq 1, ack 1, win 229, options [nop,nop,TS val 3208014114 ecr 3356187775], length 0

## 16:0616:06:08.224163 IP (tos 0x0, ttl 64, id 36849, offset 0, flags [DF], proto TCP (6), length 82)

**146.176.166.1.46534** > **192.58.128.30.domain**: Flags [P.], cksum 0x794f (incorrect -> 0xd17e), seq 1:31, ack 1, win 229, options [nop,nop,TS val 3208014115 ecr 3356187775], length 3056246% [1au] NS? . ar: . OPT UDPsize=512 OK (28)

## 16:0616:06:08.224192 IP (tos 0x0, ttl 64, id 44908, offset 0, flags [DF], proto TCP (6), length 99)

**146.176.166.1.57104** > **192.58.128.30.domain**: Flags [P.], cksum 0x7960 (incorrect -> 0xd6bf), seq 1:48, ack 1, win 229, options [nop,nop,TS val 3208014115 ecr 3356187775], length 4738372% [1au] A? www.massey.ac.nz. ar: . OPT UDPsize=512 OK (45)

## 16:0616:06:08.254998 IP (tos 0x0, ttl 49, id 35519, offset 0, flags [DF], proto TCP (6), length 52)

**192.58.128.30.domain** > **146.176.166.1.57104**: Flags [.], cksum 0x43cc (correct), seq 1, ack 48, win 114, options [nop,nop,TS val 3356187806 ecr 3208014115], length 0

## 16:0616:06:08.255034 IP (tos 0x0, ttl 49, id 22758, offset 0, flags [DF], proto TCP (6), length 52)

**192.58.128.30.domain** > **146.176.166.1.46534**: Flags [.], cksum 0x32e9 (correct), seq 1, ack 31, win 114, options [nop,nop,TS val 3356187806 ecr 3208014115], length 0

## 16:0616:06:08.255043 IP (tos 0x0, ttl 49, id 35520, offset 0, flags [DF], proto TCP (6), length 912)

**192.58.128.30.domain** > **146.176.166.1.57104**: Flags [P.], cksum 0x1184 (correct), seq 1:861, ack 48, win 114, options [nop,nop,TS val 3356187806 ecr 3208014115], length 86038372- q: A? www.massey.ac.nz. 0/10/15 ns: nz. [2d] NS ns1.dns.net.nz., nz. [2d] NS ns2.dns.net.nz., nz. [2d] NS ns3.dns.net.nz., nz. [2d] NS ns4.dns.net.nz., nz. [2d] NS ns5.dns.net.nz., nz. [2d] NS ns6.dns.net.nz., nz. [2d] NS ns7.dns.net.nz., nz. [1d] DS, nz. [1d] DS, nz. [1d] RRSIG ar: ns1.dns.net.nz. [2d] A 202.46.190.130, ns2.dns.net.nz. [2d] A 202.46.187.130, ns3.dns.net.nz. [2d] A 202.46.188.130, ns4.dns.net.nz. [2d] A 202.46.189.130, ns5.dns.net.nz. [2d] A 156.154.100.14, ns6.dns.net.nz. [2d] A 156.154.101.14, ns7.dns.net.nz. [2d] A 194.146.106.54, ns1.dns.net.nz. [2d] AAAA 2001:dce:2000:2::130, ns2.dns.net.nz. [2d] AAAA 2001:dce:7000:2::130, ns3.dns.net.nz. [2d] AAAA 2001:dce:8400:2::130, ns4.dns.net.nz. [2d] AAAA 2001:dce:d454::53, ns5.dns.net.nz. [2d] AAAA 2001:502:ad09::14, ns6.dns.net.nz. [2d] AAAA 2001:502:2eda::14, ns7.dns.net.nz. [2d] AAAA 2001:67c:1010:13::53, . OPT UDPsize=1472 OK (858)

## 16:0616:06:08.255060 IP (tos 0x0, ttl 64, id 44909, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.57104** > **192.58.128.30.domain**: Flags [.], cksum 0x7931 (incorrect -> 0x3fd1), seq 48, ack 861, win 242, options [nop,nop,TS val 3208014146 ecr 3356187806], length 0

## 16:0616:06:08.255069 IP (tos 0x0, ttl 49, id 22759, offset 0, flags [DF], proto TCP (6), length 1151)

**192.58.128.30.domain** > **146.176.166.1.46534**: Flags [P.], cksum 0xdd1e (correct), seq 1:1100, ack 31, win 114, options [nop,nop,TS val 3356187806 ecr 3208014115], length 109956246\*- q: NS? . 14/0/27 . [6d] NS a.root-servers.net., . [6d] NS b.root-servers.net., . [6d] NS c.root-servers.net., . [6d] NS d.root-servers.net., . [6d] NS e.root-servers.net., . [6d] NS f.root-servers.net., . [6d] NS g.root-servers.net., . [6d] NS h.root-servers.net., . [6d] NS i.root-servers.net., . [6d] NS j.root-servers.net., . [6d] NS k.root-servers.net., . [6d] NS l.root-servers.net., . [6d] NS m.root-servers.net., . [6d] RRSIG ar: a.root-servers.net. [6d] A 198.41.0.4, b.root-servers.net. [6d] A 192.228.79.201, c.root-servers.net. [6d] A 192.33.4.12, d.root-servers.net. [6d] A 199.7.91.13, e.root-servers.net. [6d] A 192.203.230.10, f.root-servers.net. [6d] A 192.5.5.241, g.root-servers.net. [6d] A 192.112.36.4, h.root-servers.net. [6d] A 198.97.190.53, i.root-servers.net. [6d] A 192.36.148.17, j.root-servers.net. [6d] A 192.58.128.30, k.root-servers.net. [6d] A 193.0.14.129, l.root-servers.net. [6d] A 199.7.83.42, m.root-servers.net. [6d] A 202.12.27.33, a.root-servers.net. [6d] AAAA 2001:503:ba3e::2:30, b.root-servers.net. [6d] AAAA 2001:500:84::b, c.root-servers.net. [6d] AAAA 2001:500:2::c, d.root-servers.net. [6d] AAAA 2001:500:2d::d, e.root-servers.net. [6d] AAAA 2001:500:a8::e, f.root-servers.net. [6d] AAAA 2001:500:2f::f, g.root-servers.net. [6d] AAAA 2001:500:12::d0d, h.root-servers.net. [6d] AAAA 2001:500:1::53, i.root-servers.net. [6d] AAAA 2001:7fe::53, j.root-servers.net. [6d] AAAA 2001:503:c27::2:30, k.root-servers.net. [6d] AAAA 2001:7fd::1, l.root-servers.net. [6d] AAAA 2001:500:9f::42, m.root-servers.net. [6d] AAAA 2001:dc3::35, . OPT UDPsize=1472 OK (1097)

## 16:0616:06:08.255080 IP (tos 0x0, ttl 64, id 36850, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.46534** > **192.58.128.30.domain**: Flags [.], cksum 0x7931 (incorrect -> 0x2dfb), seq 31, ack 1100, win 246, options [nop,nop,TS val 3208014146 ecr 3356187806], length 0

## 16:0616:06:08.255084 IP (tos 0x0, ttl 49, id 35521, offset 0, flags [DF], proto TCP (6), length 52)

**192.58.128.30.domain** > **146.176.166.1.57104**: Flags [F.], cksum 0x406f (correct), seq 861, ack 48, win 114, options [nop,nop,TS val 3356187806 ecr 3208014115], length 0

## 16:0616:06:08.255094 IP (tos 0x0, ttl 49, id 22760, offset 0, flags [DF], proto TCP (6), length 52)

**192.58.128.30.domain** > **146.176.166.1.46534**: Flags [F.], cksum 0x2e9d (correct), seq 1100, ack 31, win 114, options [nop,nop,TS val 3356187806 ecr 3208014115], length 0

## 16:0616:06:08.255816 IP (tos 0x0, ttl 64, id 44910, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.57104** > **192.58.128.30.domain**: Flags [F.], cksum 0x7931 (incorrect -> 0x3fcf), seq 48, ack 862, win 242, options [nop,nop,TS val 3208014146 ecr 3356187806], length 0

## 16:0616:06:08.255876 IP (tos 0x0, ttl 64, id 36851, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.46534** > **192.58.128.30.domain**: Flags [F.], cksum 0x7931 (incorrect -> 0x2df9), seq 31, ack 1101, win 246, options [nop,nop,TS val 3208014146 ecr 3356187806], length 0

## 16:0616:06:08.256667 IP (tos 0x0, ttl 64, id 63342, offset 0, flags [none], proto UDP (17), length 73)

**146.176.166.1.19450** > **194.146.106.54.domain**: [bad udp cksum 0x65c1 -> 0x60f9!] 5698% [1au] A? www.massey.ac.nz. ar: . OPT UDPsize=512 OK (45)

## 16:0616:06:08.286651 IP (tos 0x0, ttl 49, id 35522, offset 0, flags [DF], proto TCP (6), length 52)

**192.58.128.30.domain** > **146.176.166.1.57104**: Flags [.], cksum 0x402f (correct), seq 862, ack 49, win 114, options [nop,nop,TS val 3356187838 ecr 3208014146], length 0

## 16:0616:06:08.286691 IP (tos 0x0, ttl 49, id 22761, offset 0, flags [DF], proto TCP (6), length 52)

**192.58.128.30.domain** > **146.176.166.1.46534**: Flags [.], cksum 0x2e5d (correct), seq 1101, ack 32, win 114, options [nop,nop,TS val 3356187838 ecr 3208014146], length 0

## 16:0616:06:08.301051 IP (tos 0x0, ttl 46, id 38459, offset 0, flags [none], proto UDP (17), length 467)

**194.146.106.54.domain** > **146.176.166.1.19450**: [udp sum ok] 5698-| q: A? www.massey.ac.nz. 0/6/1 ns: massey.ac.nz. [1d] NS ns3.massey.ac.nz., massey.ac.nz. [1d] NS ns4.massey.ac.nz., massey.ac.nz. [1d] NS ns2.massey.ac.nz., 6b369mpufub13u6u5krba1h3cq58ibcl.ac.nz. [1h] Type50, 6b369mpufub13u6u5krba1h3cq58ibcl.ac.nz. [1h] RRSIG, obahm90cs7e1nc989df6644bhoqbqslp.ac.nz. [1h] Type50 ar: . OPT UDPsize=4096 OK (439)

## 16:0616:06:08.301331 IP (tos 0x0, ttl 64, id 36573, offset 0, flags [DF], proto TCP (6), length 60)

**146.176.166.1.13213** > **194.146.106.54.domain**: Flags [S], cksum 0x65a9 (incorrect -> 0x81a0), seq 2863523757, win 29200, options [mss 1460,sackOK,TS val 3208014192 ecr 0,nop,wscale 7], length 0

## 16:0616:06:08.347812 IP (tos 0x0, ttl 47, id 0, offset 0, flags [DF], proto TCP (6), length 60)

**194.146.106.54.domain** > **146.176.166.1.13213**: Flags [S.], cksum 0xe8e6 (correct), seq 2926583862, ack 2863523758, win 14480, options [mss 1380,sackOK,TS val 48759018 ecr 3208014192,nop,wscale 7], length 0

## 16:0616:06:08.347867 IP (tos 0x0, ttl 64, id 36574, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.13213** > **194.146.106.54.domain**: Flags [.], cksum 0x65a1 (incorrect -> 0x4ee0), seq 1, ack 1, win 229, options [nop,nop,TS val 3208014238 ecr 48759018], length 0

## 16:0616:06:08.348000 IP (tos 0x0, ttl 64, id 36575, offset 0, flags [DF], proto TCP (6), length 99)

**146.176.166.1.13213** > **194.146.106.54.domain**: Flags [P.], cksum 0x65d0 (incorrect -> 0x974d), seq 1:48, ack 1, win 229, options [nop,nop,TS val 3208014238 ecr 48759018], length 4757487% [1au] A? www.massey.ac.nz. ar: . OPT UDPsize=512 OK (45)

## 16:0616:06:08.394290 IP (tos 0x0, ttl 47, id 23646, offset 0, flags [DF], proto TCP (6), length 52)

**194.146.106.54.domain** > **146.176.166.1.13213**: Flags [.], cksum 0x4f19 (correct), seq 1, ack 48, win 114, options [nop,nop,TS val 48759029 ecr 3208014238], length 0

## 16:0616:06:08.394603 IP (tos 0x0, ttl 47, id 23647, offset 0, flags [DF], proto TCP (6), length 706)

**194.146.106.54.domain** > **146.176.166.1.13213**: Flags [P.], cksum 0x90a7 (correct), seq 1:655, ack 48, win 114, options [nop,nop,TS val 48759029 ecr 3208014238], length 65457487- q: A? www.massey.ac.nz. 0/7/4 ns: massey.ac.nz. [1d] NS ns3.massey.ac.nz., massey.ac.nz. [1d] NS ns4.massey.ac.nz., massey.ac.nz. [1d] NS ns2.massey.ac.nz., 6b369mpufub13u6u5krba1h3cq58ibcl.ac.nz. [1h] Type50, 6b369mpufub13u6u5krba1h3cq58ibcl.ac.nz. [1h] RRSIG, obahm90cs7e1nc989df6644bhoqbqslp.ac.nz. [1h] Type50, obahm90cs7e1nc989df6644bhoqbqslp.ac.nz. [1h] RRSIG ar: ns2.massey.ac.nz. [1d] A 130.123.96.70, ns3.massey.ac.nz. [1d] A 130.123.108.7, ns4.massey.ac.nz. [1d] A 130.123.104.69, . OPT UDPsize=4096 OK (652)

## 16:0616:06:08.394641 IP (tos 0x0, ttl 64, id 36576, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.13213** > **194.146.106.54.domain**: Flags [.], cksum 0x65a1 (incorrect -> 0x4bdf), seq 48, ack 655, win 239, options [nop,nop,TS val 3208014285 ecr 48759029], length 0

## 16:0616:06:08.395065 IP (tos 0x0, ttl 64, id 36577, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.13213** > **194.146.106.54.domain**: Flags [F.], cksum 0x65a1 (incorrect -> 0x4bdd), seq 48, ack 655, win 239, options [nop,nop,TS val 3208014286 ecr 48759029], length 0

## 16:0616:06:08.395249 IP (tos 0x0, ttl 64, id 44048, offset 0, flags [none], proto UDP (17), length 73)

**146.176.166.1.28589** > **130.123.104.69.domain**: [bad udp cksum 0x23b9 -> 0x4cee!] 18594% [1au] A? www.massey.ac.nz. ar: . OPT UDPsize=512 OK (45)

## 16:0616:06:08.441437 IP (tos 0x0, ttl 47, id 23648, offset 0, flags [DF], proto TCP (6), length 52)

**194.146.106.54.domain** > **146.176.166.1.13213**: Flags [F.], cksum 0x4c4d (correct), seq 655, ack 49, win 114, options [nop,nop,TS val 48759041 ecr 3208014286], length 0

## 16:0616:06:08.441490 IP (tos 0x0, ttl 64, id 36578, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.13213** > **194.146.106.54.domain**: Flags [.], cksum 0x65a1 (incorrect -> 0x4ba2), seq 49, ack 656, win 239, options [nop,nop,TS val 3208014332 ecr 48759041], length 0

## 16:0616:06:08.710492 IP (tos 0x0, ttl 40, id 56357, offset 0, flags [none], proto UDP (17), length 113)

**130.123.104.69.domain** > **146.176.166.1.28589**: [udp sum ok] 18594\*- q: A? www.massey.ac.nz. 2/0/1 www.massey.ac.nz. [2h] CNAME ns-proxy1.massey.ac.nz., ns-proxy1.massey.ac.nz. [2h] A 130.123.10.101 ar: . OPT UDPsize=4096 OK (85)

## 16:0616:06:08.711331 IP (tos 0x0, ttl 64, id 26349, offset 0, flags [none], proto UDP (17), length 59)

**146.176.166.1.derby-repli** > **193.0.14.129.domain**: [bad udp cksum 0x086c -> 0x6b3c!] 53977% [1au] DS? nz. ar: . OPT UDPsize=512 OK (31)

## 16:0616:06:08.723372 IP (tos 0x0, ttl 50, id 31995, offset 0, flags [DF], proto UDP (17), length 430)

**193.0.14.129.domain** > **146.176.166.1.derby-repli**: [udp sum ok] 53977\*- q: DS? nz. 3/0/1 nz. [1d] DS, nz. [1d] DS, nz. [1d] RRSIG ar: . OPT UDPsize=4096 OK (402)

## 16:0616:06:08.724232 IP (tos 0x0, ttl 64, id 38373, offset 0, flags [none], proto UDP (17), length 62)

**146.176.166.1.25912** > **156.154.100.14.domain**: [bad udp cksum 0x3996 -> 0xfd78!] 57663% [1au] DS? ac.nz. ar: . OPT UDPsize=512 OK (34)

## 16:0616:06:08.746429 IP (tos 0x0, ttl 57, id 51085, offset 0, flags [none], proto UDP (17), length 308)

**156.154.100.14.domain** > **146.176.166.1.25912**: [udp sum ok] 57663\*- q: DS? ac.nz. 3/0/1 ac.nz. [1h] DS, ac.nz. [1h] DS, ac.nz. [1h] RRSIG ar: . OPT UDPsize=4096 OK (280)

## 16:0616:06:08.747081 IP (tos 0x0, ttl 64, id 56827, offset 0, flags [none], proto UDP (17), length 59)

**146.176.166.1.58155** > **202.46.189.130.domain**: [bad udp cksum 0xc09b -> 0xaee2!] 1734% [1au] DNSKEY? nz. ar: . OPT UDPsize=512 OK (31)

## 16:0616:06:09.017377 IP (tos 0x0, ttl 51, id 39159, offset 0, flags [none], proto UDP (17), length 59)

**202.46.189.130.domain** > **146.176.166.1.58155**: [udp sum ok] 1734\*-|$ q: DNSKEY? nz. 0/0/1 ar: . OPT UDPsize=4096 OK (31)

## 16:0616:06:09.017727 IP (tos 0x0, ttl 64, id 50772, offset 0, flags [DF], proto TCP (6), length 60)

**146.176.166.1.62674** > **202.46.189.130.domain**: Flags [S], cksum 0xc091 (incorrect -> 0x877a), seq 3274615400, win 29200, options [mss 1460,sackOK,TS val 3208014908 ecr 0,nop,wscale 7], length 0

## 16:0616:06:09.287836 IP (tos 0x0, ttl 51, id 0, offset 0, flags [DF], proto TCP (6), length 60)

**202.46.189.130.domain** > **146.176.166.1.62674**: Flags [S.], cksum 0x4447 (correct), seq 3097407450, ack 3274615401, win 28960, options [mss 1380,sackOK,TS val 1961649916 ecr 3208014908,nop,wscale 7], length 0

## 16:0616:06:09.287907 IP (tos 0x0, ttl 64, id 50773, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.62674** > **202.46.189.130.domain**: Flags [.], cksum 0xc089 (incorrect -> 0xe1f0), seq 1, ack 1, win 229, options [nop,nop,TS val 3208015178 ecr 1961649916], length 0

## 16:0616:06:09.288123 IP (tos 0x0, ttl 64, id 50774, offset 0, flags [DF], proto TCP (6), length 85)

**146.176.166.1.62674** > **202.46.189.130.domain**: Flags [P.], cksum 0xc0aa (incorrect -> 0xcab0), seq 1:34, ack 1, win 229, options [nop,nop,TS val 3208015179 ecr 1961649916], length 3328867% [1au] DNSKEY? nz. ar: . OPT UDPsize=512 OK (31)

## 16:0616:06:09.557942 IP (tos 0x0, ttl 51, id 46059, offset 0, flags [DF], proto TCP (6), length 52)

**202.46.189.130.domain** > **146.176.166.1.62674**: Flags [.], cksum 0xe18d (correct), seq 1, ack 34, win 227, options [nop,nop,TS val 1961649983 ecr 3208015179], length 0

## 16:0616:06:09.558019 IP (tos 0x0, ttl 51, id 46060, offset 0, flags [DF], proto TCP (6), length 947)

**202.46.189.130.domain** > **146.176.166.1.62674**: Flags [P.], cksum 0xa42f (correct), seq 1:896, ack 34, win 227, options [nop,nop,TS val 1961649983 ecr 3208015179], length 89528867\*- q: DNSKEY? nz. 4/0/1 nz. [1h] DNSKEY, nz. [1h] DNSKEY, nz. [1h] DNSKEY, nz. [1h] RRSIG ar: . OPT UDPsize=4096 OK (893)

## 16:0616:06:09.558039 IP (tos 0x0, ttl 64, id 50775, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.62674** > **202.46.189.130.domain**: Flags [.], cksum 0xc089 (incorrect -> 0xdcf0), seq 34, ack 896, win 243, options [nop,nop,TS val 3208015449 ecr 1961649983], length 0

## 16:0616:06:09.558452 IP (tos 0x0, ttl 64, id 50776, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.62674** > **202.46.189.130.domain**: Flags [F.], cksum 0xc089 (incorrect -> 0xdcef), seq 34, ack 896, win 243, options [nop,nop,TS val 3208015449 ecr 1961649983], length 0

## 16:0616:06:09.559770 IP (tos 0x0, ttl 64, id 5495, offset 0, flags [none], proto UDP (17), length 69)

**146.176.166.1.13034** > **202.46.187.130.domain**: [bad udp cksum 0xbea5 -> 0x6943!] 18668% [1au] DS? massey.ac.nz. ar: . OPT UDPsize=512 OK (41)

## 16:0616:06:09.826235 IP (tos 0x0, ttl 41, id 17676, offset 0, flags [none], proto UDP (17), length 69)

**202.46.187.130.domain** > **146.176.166.1.13034**: [udp sum ok] 18668\*-| q: DS? massey.ac.nz. 0/0/1 ar: . OPT UDPsize=4096 OK (41)

## 16:0616:06:09.826594 IP (tos 0x0, ttl 64, id 36745, offset 0, flags [DF], proto TCP (6), length 60)

**146.176.166.1.57433** > **202.46.187.130.domain**: Flags [S], cksum 0xbe91 (incorrect -> 0x1389), seq 334291180, win 29200, options [mss 1460,sackOK,TS val 3208015717 ecr 0,nop,wscale 7], length 0

## 16:0616:06:09.828284 IP (tos 0x0, ttl 51, id 46061, offset 0, flags [DF], proto TCP (6), length 52)

**202.46.189.130.domain** > **146.176.166.1.62674**: Flags [F.], cksum 0xdcba (correct), seq 896, ack 35, win 227, options [nop,nop,TS val 1961650051 ecr 3208015449], length 0

## 16:0616:06:09.828327 IP (tos 0x0, ttl 64, id 50777, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.62674** > **202.46.189.130.domain**: Flags [.], cksum 0xc089 (incorrect -> 0xdb9c), seq 35, ack 897, win 243, options [nop,nop,TS val 3208015719 ecr 1961650051], length 0

## 16:0616:06:10.092686 IP (tos 0x0, ttl 41, id 0, offset 0, flags [DF], proto TCP (6), length 60)

**202.46.187.130.domain** > **146.176.166.1.57433**: Flags [S.], cksum 0xb0a6 (correct), seq 850529251, ack 334291181, win 28960, options [mss 1380,sackOK,TS val 553321601 ecr 3208015717,nop,wscale 7], length 0

## 16:0616:06:10.092751 IP (tos 0x0, ttl 64, id 36746, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.57433** > **202.46.187.130.domain**: Flags [.], cksum 0xbe89 (incorrect -> 0x4e54), seq 1, ack 1, win 229, options [nop,nop,TS val 3208015983 ecr 553321601], length 0

## 16:0616:06:10.093091 IP (tos 0x0, ttl 64, id 36747, offset 0, flags [DF], proto TCP (6), length 95)

**146.176.166.1.57433** > **202.46.187.130.domain**: Flags [P.], cksum 0xbeb4 (incorrect -> 0x1df7), seq 1:44, ack 1, win 229, options [nop,nop,TS val 3208015984 ecr 553321601], length 4354309% [1au] DS? massey.ac.nz. ar: . OPT UDPsize=512 OK (41)

## 16:0616:06:10.359288 IP (tos 0x0, ttl 41, id 60251, offset 0, flags [DF], proto TCP (6), length 52)

**202.46.187.130.domain** > **146.176.166.1.57433**: Flags [.], cksum 0x4de7 (correct), seq 1, ack 44, win 227, options [nop,nop,TS val 553321668 ecr 3208015984], length 0

## 16:0616:06:10.359348 IP (tos 0x0, ttl 41, id 60252, offset 0, flags [DF], proto TCP (6), length 827)

**202.46.187.130.domain** > **146.176.166.1.57433**: Flags [P.], cksum 0x01c2 (correct), seq 1:776, ack 44, win 227, options [nop,nop,TS val 553321668 ecr 3208015984], length 77554309\*- q: DS? massey.ac.nz. 0/6/1 ns: 6b369mpufub13u6u5krba1h3cq58ibcl.ac.nz. [1h] Type50, 6b369mpufub13u6u5krba1h3cq58ibcl.ac.nz. [1h] RRSIG, ac.nz. [1h] SOA loopback.dns.net.nz. soa.nzrs.net.nz. 2017031820 900 300 604800 3600, ac.nz. [1h] RRSIG, obahm90cs7e1nc989df6644bhoqbqslp.ac.nz. [1h] Type50, obahm90cs7e1nc989df6644bhoqbqslp.ac.nz. [1h] RRSIG ar: . OPT UDPsize=4096 OK (773)

## 16:0616:06:10.359364 IP (tos 0x0, ttl 64, id 36748, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.57433** > **202.46.187.130.domain**: Flags [.], cksum 0xbe89 (incorrect -> 0x49c8), seq 44, ack 776, win 241, options [nop,nop,TS val 3208016250 ecr 553321668], length 0

## 16:0616:06:10.359753 IP (tos 0x0, ttl 64, id 36749, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.57433** > **202.46.187.130.domain**: Flags [F.], cksum 0xbe89 (incorrect -> 0x49c7), seq 44, ack 776, win 241, options [nop,nop,TS val 3208016250 ecr 553321668], length 0

## 16:0616:06:10.360097 IP (tos 0x0, ttl 64, id 62041, offset 0, flags [none], proto UDP (17), length 62)

**146.176.166.1.19753** > **202.46.188.130.domain**: [bad udp cksum 0xbf9e -> 0xe227!] 35223% [1au] DNSKEY? ac.nz. ar: . OPT UDPsize=512 OK (34)

## 16:0616:06:10.625786 IP (tos 0x0, ttl 41, id 60253, offset 0, flags [DF], proto TCP (6), length 52)

**202.46.187.130.domain** > **146.176.166.1.57433**: Flags [F.], cksum 0x4991 (correct), seq 776, ack 45, win 227, options [nop,nop,TS val 553321735 ecr 3208016250], length 0

## 16:0616:06:10.625838 IP (tos 0x0, ttl 64, id 36750, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.57433** > **202.46.187.130.domain**: Flags [.], cksum 0xbe89 (incorrect -> 0x4879), seq 45, ack 777, win 241, options [nop,nop,TS val 3208016516 ecr 553321735], length 0

## 16:0616:06:10.635565 IP (tos 0x0, ttl 40, id 12806, offset 0, flags [none], proto UDP (17), length 62)

**202.46.188.130.domain** > **146.176.166.1.19753**: [udp sum ok] 35223\*-|$ q: DNSKEY? ac.nz. 0/0/1 ar: . OPT UDPsize=4096 OK (34)

## 16:0616:06:10.635902 IP (tos 0x0, ttl 64, id 432, offset 0, flags [DF], proto TCP (6), length 60)

**146.176.166.1.24117** > **202.46.188.130.domain**: Flags [S], cksum 0xbf91 (incorrect -> 0x672c), seq 2884793150, win 29200, options [mss 1460,sackOK,TS val 3208016526 ecr 0,nop,wscale 7], length 0

## 16:0616:06:10.911336 IP (tos 0x0, ttl 40, id 0, offset 0, flags [DF], proto TCP (6), length 60)

**202.46.188.130.domain** > **146.176.166.1.24117**: Flags [S.], cksum 0xfbb8 (correct), seq 3843828286, ack 2884793151, win 5792, options [mss 1380,sackOK,TS val 690523807 ecr 3208016526,nop,wscale 7], length 0

## 16:0616:06:10.911388 IP (tos 0x0, ttl 64, id 433, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.24117** > **202.46.188.130.domain**: Flags [.], cksum 0xbf89 (incorrect -> 0x3edc), seq 1, ack 1, win 229, options [nop,nop,TS val 3208016802 ecr 690523807], length 0

## 16:0616:06:10.911583 IP (tos 0x0, ttl 64, id 434, offset 0, flags [DF], proto TCP (6), length 88)

**146.176.166.1.24117** > **202.46.188.130.domain**: Flags [P.], cksum 0xbfad (incorrect -> 0x4df9), seq 1:37, ack 1, win 229, options [nop,nop,TS val 3208016802 ecr 690523807], length 3627003% [1au] DNSKEY? ac.nz. ar: . OPT UDPsize=512 OK (34)

## 16:0616:06:11.186839 IP (tos 0x0, ttl 40, id 53025, offset 0, flags [DF], proto TCP (6), length 52)

**202.46.188.130.domain** > **146.176.166.1.24117**: Flags [.], cksum 0x3f2a (correct), seq 1, ack 37, win 46, options [nop,nop,TS val 690523876 ecr 3208016802], length 0

## 16:0616:06:11.186883 IP (tos 0x0, ttl 40, id 53026, offset 0, flags [DF], proto TCP (6), length 953)

**202.46.188.130.domain** > **146.176.166.1.24117**: Flags [P.], cksum 0xe8ce (correct), seq 1:902, ack 37, win 46, options [nop,nop,TS val 690523876 ecr 3208016802], length 90127003\*- q: DNSKEY? ac.nz. 4/0/1 ac.nz. [1h] DNSKEY, ac.nz. [1h] DNSKEY, ac.nz. [1h] DNSKEY, ac.nz. [1h] RRSIG ar: . OPT UDPsize=4096 OK (899)

## 16:0616:06:11.186902 IP (tos 0x0, ttl 64, id 435, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.24117** > **202.46.188.130.domain**: Flags [.], cksum 0xbf89 (incorrect -> 0x39cd), seq 37, ack 902, win 243, options [nop,nop,TS val 3208017077 ecr 690523876], length 0

## 16:0616:06:11.187357 IP (tos 0x0, ttl 64, id 436, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.24117** > **202.46.188.130.domain**: Flags [F.], cksum 0xbf89 (incorrect -> 0x39cb), seq 37, ack 902, win 243, options [nop,nop,TS val 3208017078 ecr 690523876], length 0

## 16:0616:06:11.189001 IP (tos 0x0, ttl 64, id 11301, offset 0, flags [none], proto UDP (17), length 79)

**146.176.166.1.32920** > **130.123.108.7.domain**: [bad udp cksum 0x2781 -> 0x97f5!] 36376% [1au] A? ns-proxy1.massey.ac.nz. ar: . OPT UDPsize=512 OK (51)

## 16:0616:06:11.462116 IP (tos 0x0, ttl 40, id 53027, offset 0, flags [DF], proto TCP (6), length 52)

**202.46.188.130.domain** > **146.176.166.1.24117**: Flags [F.], cksum 0x3a4a (correct), seq 902, ack 38, win 46, options [nop,nop,TS val 690523945 ecr 3208017078], length 0

## 16:0616:06:11.462162 IP (tos 0x0, ttl 64, id 437, offset 0, flags [DF], proto TCP (6), length 52)

**146.176.166.1.24117** > **202.46.188.130.domain**: Flags [.], cksum 0xbf89 (incorrect -> 0x3872), seq 38, ack 903, win 243, options [nop,nop,TS val 3208017353 ecr 690523945], length 0

## 16:0616:06:11.512497 IP (tos 0x0, ttl 40, id 56993, offset 0, flags [none], proto UDP (17), length 95)

**130.123.108.7.domain** > **146.176.166.1.32920**: [udp sum ok] 36376\*- q: A? ns-proxy1.massey.ac.nz. 1/0/1 ns-proxy1.massey.ac.nz. [2h] A 130.123.10.101 ar: . OPT UDPsize=4096 OK (67)