ARBOR NETWORKS

Your Bitcoins, or Your Site!

An Overview of the DD4BC 2014-2015 DDoS Extortion Campaign

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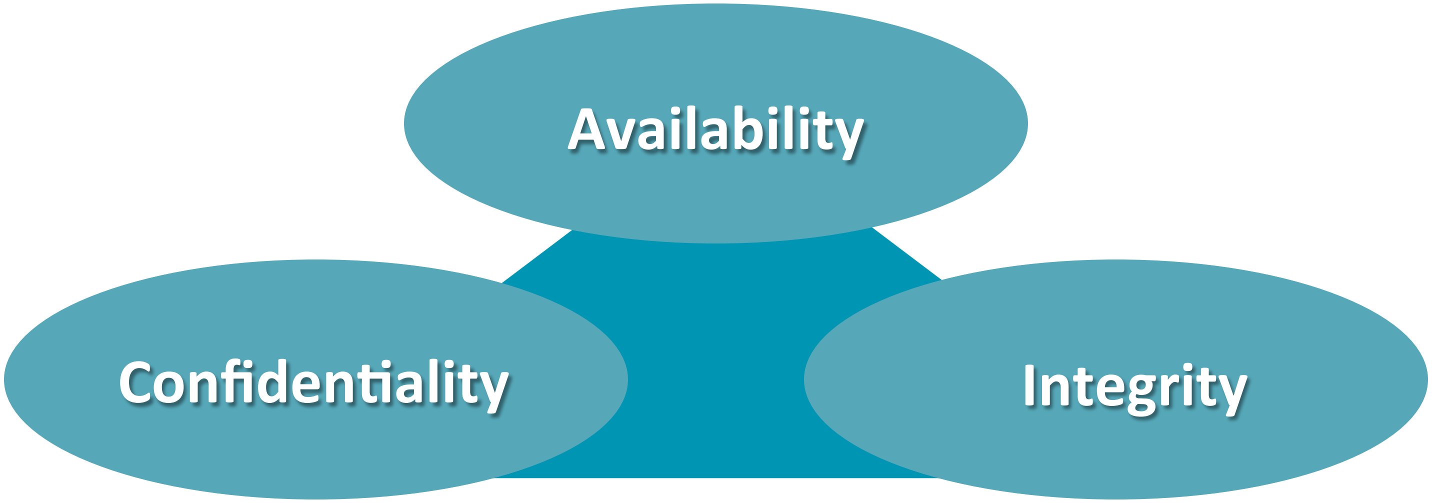
Introduction & Context

DDoS Background

What is a **D**istributed **D**enial **of S**ervice (DDoS) attack?

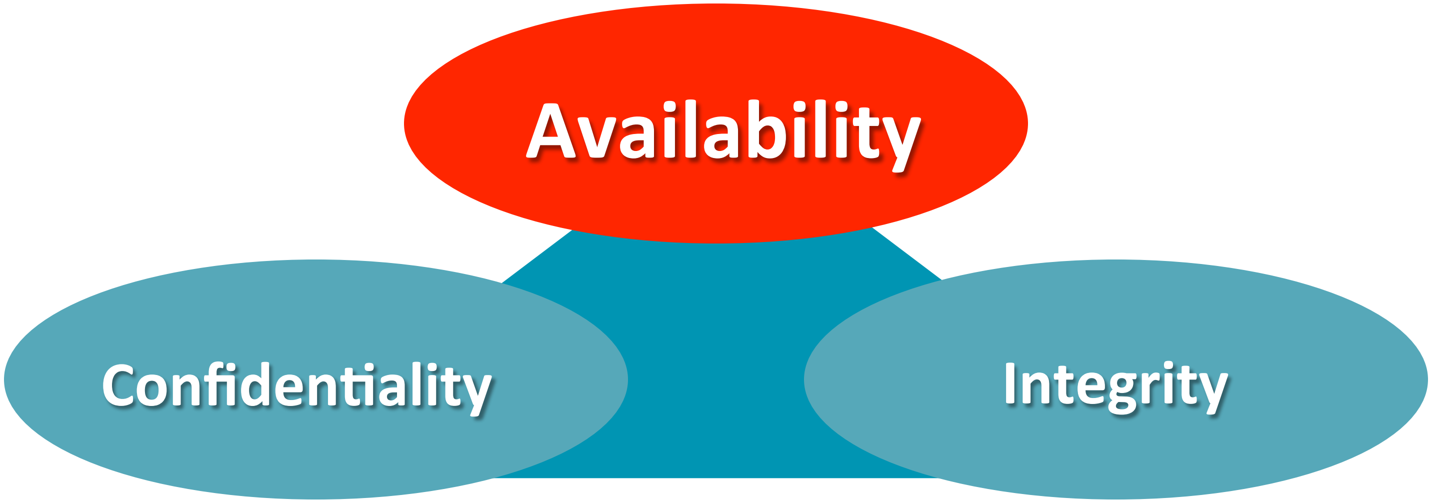
- An attempt to **consume** finite **resources**, **exploit weaknesses** in software design or implementation, or **exploit lack** of infrastructure **capacity**
- Targets the **availability** and **utility** of computing and network resources
- Attacks are almost always **distributed** for even more significant effect (i.e., DDoS)
- The **collateral damage** caused by an attack can be as bad, if not worse, than the attack itself
- **DDoS attacks affect availability**! No availability, no applications/services/data/Internet! No revenue!
- DDoS attacks are attacks **against capacity and/or state**!

Three Security Characteristics



- The goal of security is to maintain these three characteristics

Three Security Characteristics



- The primary goal of DDoS defense is maintaining availability in the face of attack

A Brief History of DDoS Extortion

Blackmail vs. Extortion.

- Blackmail = someone threatens to release potentially damaging information about the victim unless he receives payment (this is how the Ashley Madison imbroglio started off).
- Extortion = someone threatens to take some harmful action against the victim unless he receives payment.
- Blackmail these days often uses Skype, webcams, etc.
- Extortion these days often uses DDoS attacks.

Way Back in the Earlies

- First DDoS attacks on nascent Internet related to IRC channel disputes, ‘warez’ scene in the late 1980s/early 1990s.
- First DDoS extortion related to both IRC and ‘warez’ – i.e., ‘give me ops in your channel’, ‘give me your 0-day warez first’.
- Mostly confined to IRC protocols like CTCP, DCC.
- Graduated to ICMP – this is when DDoS started to become a more general problem on the Internet.
- SYN-flooding started in 1995. Other methods followed.

DDoS Extortion Goes Commercial

- First monetary DDoS extortion emerged in the late 1990s.
- Targeted ‘fringe’ online businesses – online gambling operations, ‘adult’ entertainment.
- Early DDoS extortion activity emerged in Caribbean, Latin America – lots of early ‘fringe’ online businesses established there in order to evade U.S. and European laws, regulations, scrutiny.
- ISPs who tried to help targeted customers threatened with being DDoSed out of existence (this has happened multiple times over the years).
- Some ISPs decided this was a good model – stood aside and encouraged attackers in exchange for a portion of the ‘take’.
- A few ISPs even helped attackers identify targets!

DDoS Extortion Becomes the New Normal

- DDoS extortion has been around as long as the Internet.
- Totally subjective estimate that extortion is the motive behind ~15% of DDoS attacks.
- Many ideologically-motivated DDoS attacks are actually a form of extortion – trying to force the targeted organization to stop doing something the attackers find objectionable, or start doing something the attackers find desirable.
- Early commercial DDoS extortion rackets used wire transfers to collect payments – route through multiple banks, hard to trace (at the time).
- Payoff channels migrated to Western Union, PayPal, eGold (remember them)?, other early online pseudo-fiat currencies.
- Some payoffs in material goods purchased by extortee via credit cards, delivered to drop addresses.
- A lot of intra-miscreant DDoS is extortion – demanding CC dumps, etc.

What is Bitcoin?

What is Bitcoin?

Magic Internet Money

What is Bitcoin?

- Decentralized, anonymous, digitally-generated (by Bitcoin ‘mining’) crypto-currency.
- Transactions are verifiable, recorded in a public distributed ledger.
- Not the first crypto-currency, but the most popular and well-known.
- All transactions are public.
- Fees lower than credit cards, paid by purchaser.
- Lots of criminal activity around Bitcoin – theft of Bitcoins from electronic ‘wallets’, botnets set up to covertly mine Bitcoins, payment for illicit goods/services, etc.
- DDoS used for Bitcoin valuation manipulation by DDoSing Bitcoin miners, thereby affecting expansion of Bitcoin currency volume.
- Most ordinary people have either never heard of it or have no idea what it actually is or how it works.

Why Use Bitcoin for DDoS Extortion Payouts?

- Accepted/convertible internationally.
- Potentially anonymous, like cash.
- Difficult to trace through multiple transactions.
- Until recently, Bitcoin was a high-valuation currency.
- No need to involve government agencies, regulated entities in Bitcoin transactions.
- No tax (practically speaking).
- Victims can potentially mine more Bitcoin for themselves – not directly tied to physical-world labor/compensation exchanges.

Disadvantages of Using Bitcoin for Extortion Payouts

- Myth that it's 'untraceable' – untrue, it can be traced, somewhat analogous to serial numbers on physical cash.
- Potentially easier to trace than cash.
- Potentially more susceptible to theft than cash.
- Highly volatile, conversion rates swing up and down.
- Many of the victims *have never heard of it*, and/or *have no idea* how to get their hands on Bitcoins.

What is DD4BC?

- A threat actor who launches DDoS extortion attacks against organizations, demanding payment to cease the attacks in Bitcoin.
- DD4BC = ‘DDoS for Bitcoins’
- Self-labeled acronym. Often mangled in conversation, news articles, etc.
- Currently the most notorious DDoS attacker in both the public and the operational security spheres.

Genesis of DD4BC

DD4BC Makes Its Debut

- First emerged in July 2014, debuted with DDoS extortion attempt against Bitcoin lotto sites (yes, that is a thing).
- Attacked online Bitcoin-based online sports betting house about a week later.
- This second verified DD4BC attack was the first known instance of a DD4BC victim paying – the victim initially paid off DD4BC in order to buy time to put defenses in place, mitigated subsequent attacks.
- Contrary to claims of one-time-only payment, DD4BC kept hitting up the betting house week after week, until they could defend against the attacks.
- Throughout the rest of 2014, DD4BC attacked various Bitcoin mining pools, Bitcoin exchanges, Bitcoin wallet providers, etc., mostly in Europe and North America.
- Most/all targets were Bitcoin-savvy.
- Extortion demands have ranged from 1 – 100 Bitcoins: approximately $227USD - $22,700USD / $317 - $31,700AUD.

‘Fringe’ Businesses – the Pattern Repeats

- Online betting shops, even when they’re legal, are generally viewed as being on the edges of legitimate commerce. They generally aren’t eager to engage with the authorities.
- Likewise for Bitcoin miners, Bitcoin exchanges, etc. They tend to try and keep as far away from ‘official’ notice as possible.
- In many cases, authorities regard these types of businesses with mutual suspicion, aren’t overly eager to help.
- And of course, law enforcement action against DDoS attackers in general nets very few arrests/convictions – almost all of those who end up behind bars/fined essentially ratted themselves out by bragging about their crimes.

Broadening the Campaign

Going After the Financials

Going After the Financials

- In 2015 Q2, DD4BC shifted its target base to financial institutions - largely to the exclusion of Bitcoin-specific organizations - as well as to e-commerce sites.
- So far, DD4BC has attacked financial institutions in Central and Western Europe, Switzerland, Guernsey, Iceland, North America (relatively few), Australia, New Zealand, and Japan.
- Ancillary financial services organizations such as ACH processors and other types of non-customer-facing specialties have also been attacked.
- No financial organization has publicly admitted to paying DD4BC, but at least one has done so.
- Most of the financial institutions attacked so far have been mid-tier and smaller, with only a few considered to be first-tier.
- Previously, DD4BC issued far more threats than attacks, and abandoned unsuccessful attacks quickly. This has changed – more attacks carried out, greater persistence.

Not Just Banks!

- DD4BC has also attempted to extort ISPs and e-commerce sites.
- In Europe, DD4BC spammed thousands of users of a shared hosting provider with DDoS extortion demands emailed to ‘abuse@’, ‘security@’, and ‘root@’ email addresses.
- This is atypical of DD4BC; most DD4BC extortion emails are deliberately targeted at specific organizations.
- E-commerce sites have also been threatened and attacked.
- Online gambling sites and sports betting shops are still being targeted, as well.
- DD4BC has attacked specific customers of several IaaS and VPS providers, in some cases causing significant collateral damage to multiple customers of those services.

Evolution of DD4BC Modus Operandi

Typical DD4BC Extortion Process

- Unannounced DDoS attack against targeted organization, 10-15gb/sec, anywhere from 15 minutes to an hour in length.
- DD4BC then send email extortion demand providing detailed knowledge of DDoS attack, demanding payment within 24 hours.
- If the victim doesn't pay, follow-up email increases the amount of Bitcoin payout, and threatens another DDoS attack – up to 60gb/sec observed. DD4BC claim 400gb/sec of DDoS attack generation capability, but this hasn't been borne out, so far.
- DD4BC DDoSes some (not all) targets who don't pay, sends repeated emails demanding increased extortion payout amounts.
- DD4BC will increase the demanded extortion payouts if the target takes inadequate defensive measures.

Typical DD4BC Extortion Process (cont.)

- DDoS attacks persist anywhere from a few hours to 12 hours to a series of attacks over multiple days.
- If the DDoS attack is successfully thwarted, DD4BC will eventually give up and go away.
- Sometimes, DD4BC will target the same organization again, a few days or weeks later.
- On a couple of occasions, DD4BC has re-targeted the same organization dozens of times.

Typical DD4BC Initial Extortion Demand

From: DD4BC Team [mailto:dd4bct@gmail.com] Sent: 10 April 2015 02:07 PM
Subject: Re: DDOS ATTACK!

Hitting example.com at the moment.
Good luck if you think you can stop what they can't. But you still have time.

On Thu, Apr 9, 2015 at 3:46 PM, DD4BC Team <dd4bct@gmail.com> wrote: Hello,

To introduce ourselves first:

https://blogs.akamai.com/2014/12/dd4bc-anatomy-of-a-bitcoin-extortion-campaign.html http://bitcoinbountyhunter.com/bitalo.html

http://cointelegraph.com/news/113499/notorious-hacker-group-involved-in-excoin-theft-owner-accuses- ccedk-of-withholding-info

Or just google "DD4BC" and you will find more info.
Recently, we were DDoS-ing example.net. You probably know it already.

So, it's your turn!

<site> is going under attack unless you pay 20 Bitcoin. Pay to 18NeYaX6GCnibNkwyuGhGLuU2tYzbxvW7z

Please note that it will not be easy to mitigate our attack, because our current UDP flood power is 400-500 Gbps, so don't even bother.

Right now we are running small demonstrative attack on your server.
Don't worry, it will stop in 1 hour. It's just to prove that we are serious.

We are aware that you probably don't have 20 BTC at the moment, so we are giving you 48 hours to get it and pay us.

We do not know your exact location, so it's hard to recommend any Bitcoin exchanger, so use Google. Current price of 1 BTC is about 250 USD.

IMPORTANT: You don't even have to reply. Just pay 20 BTC to 18NeYaX6GCnibNkwyuGhGLuU2tYzbxvW7z – we will know it's you and you will never hear from us again.
We say it because for big companies it's usually the problem as they don't want that there is proof that they cooperated. If you need to contact us, feel free to use some free email service.

But if you ignore us, and don't pay within 48 hours, long term attack will start, price to stop will go to 50 BTC and will keep increasing for every hour of attack.

ONE MORE TIME: It's a one-time payment. Pay and you will not hear from us ever again!

Typical DD4BC Initial Extortion Demand

- Date: Sun, 15 Feb 2015 17:42:31 +0000
  From: "DD4BC Team" <dd4bc@Safe-mail.net>
- btw. Attack temporarily stopped.
  If payment not received within 6 hours, attack restarts and price will double up.
- -------- Original Message --------
- From: "DD4BC Team" <dd4bc@Safe-mail.net>
  Subject: DDOS ATTACK!
  Date: Sun, 15 Feb 2015 12:34:28 +0000
- Hello,
  Your site is extremely vulnerable to DDoS attacks.
  I want to offer you info how to properly setup your protection, so that you can't be ddosed. If you want info on fixing it, pay me 1.5 BTC to 1E8R3cgnr2UcusyZ9k5KUvkj3fXYd9oWW6

Typical DD4BC Initial Extortion Demand

From: "DD4BC Team" <dd4bc@Safe-mail.net>

Date: Mon, 16 Feb 2015 14:13:40 +0000

Subject: Re: DDOS ATTACK!

Return site back online without paying me first, it's going down again (protection will not help) and price to stop it increases to 3 BTC. And will keep doubling for every day of attack.

-------- Original Message --------

From: "DD4BC Team" <dd4bc@Safe-mail.net>
Subject: DDOS ATTACK!
Date: Sun, 15 Feb 2015 12:34:28 +0000

Hello,
Your site is extremely vulnerable to DDoS attacks.
I want to offer you info how to properly setup your protection, so that you can't be ddosed. If you want info on fixing it, pay me 1.5 BTC to 1E8R3cgnr2UcusyZ9k5KUvkj3fXYd9oWW6

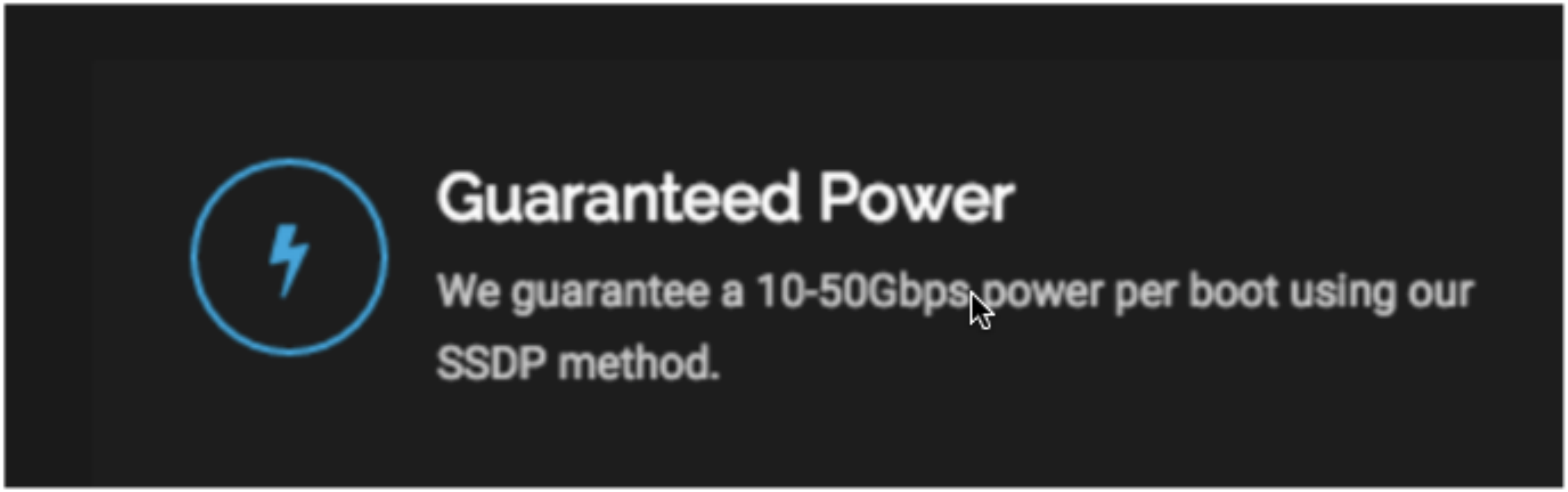
Initial DD4BC Attack Profile

- DD4BC first attacked targets with a mixture of ntp, SSDP, and DNS reflection/amplification attacks, with SYN-flooding mixed in, from time to time.
- As time progressed, ntp and SSDP reflection/ amplification became the primary vectors, with occasional SYN-floods.
- If a targeted organization successfully defends against one attack vector, DD4BC will shift to another one.
- ntp and SSDP reflection/amplification vectors are sometimes used simultaneously.
- DD4BC concentrates attacks on the Web sites of targeted organizations.
- DD4BC typically attacks only one target at a time.

DD4BC Relies on Booters/Stressers

- It appears that DD4BC has settled on utilizing commercial ‘booter’/’stresser’ services to launch DDoS attacks.
- While these masquerade as testing tools, they’re actually cloud-based DDoS attack services; attackers typically pay hourly rates to use them (mainly in Bitcoins, of course).
- As various booter/stresser services have expanded their attack offerings, DD4BC has broadened its DDoS attack methodologies to include chargen reflection/amplification and WordPress XMLRPC ‘pingback’ DDoS attacks.
- DD4BC has largely adopted a ‘cookie-cutter’, standardized approach to attacking extortion targets.
- DD4BC will react to successful DDoS defense, varying attack methodologies (SSDP to ntp to SYN-flooding to WordPress XMLRPC ‘pingback) and increasing attack bandwidth.

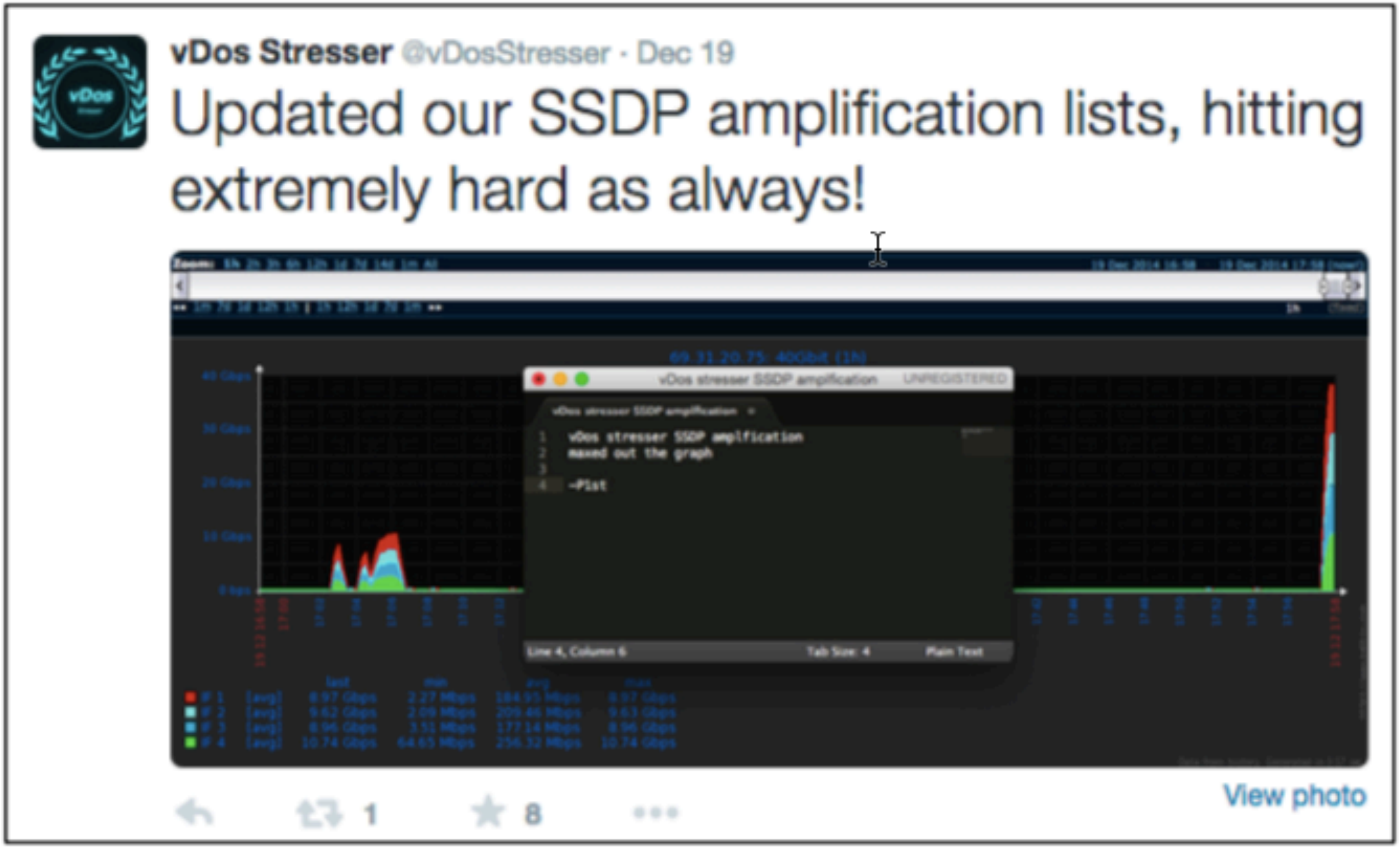
DD4BC Relies on Booters/Stressers



Guaranteed Power

We guarantee a 10-50Gbps power per boot using our SSDP method.

DD4BC Relies on Booters/Stressers



vDos Stresser @vDosStresser · Dec 19

Updated our SSDP amplification lists, hitting extremely hard as always!

69.31.20.75: 40Gbit (1h)

vDos stresser SSDP amplification UNREGISTERED

```
vDos stresser SSDP amplification
maxed out the graph

-P1st
```

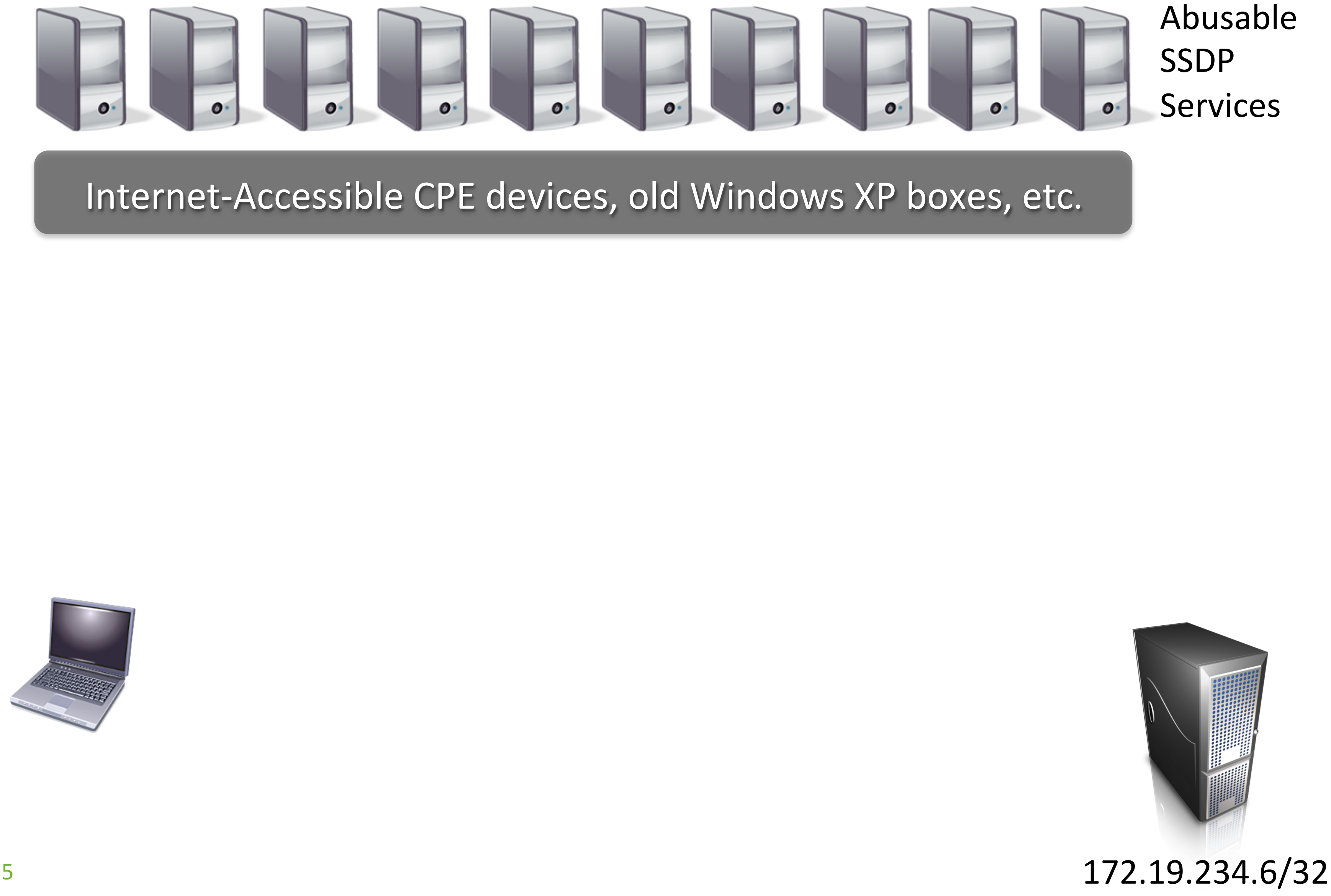
Line 4, Column 6 Tab Size: 4 Plain Text

		last	min	avg	max
🟥 IF 1	[avg]	8.97 Gbps	2.27 Mbps	184.95 Mbps	8.97 Gbps
🟦 IF 2	[avg]	9.62 Gbps	2.09 Mbps	209.46 Mbps	9.63 Gbps
🟦 IF 3	[avg]	8.96 Gbps	3.51 Mbps	177.14 Mbps	8.96 Gbps
🟩 IF 4	[avg]	10.74 Gbps	64.65 Mbps	256.32 Mbps	10.74 Gbps

SSDP Innovation – Leveraging Services Behind CPE

- We have observed DD4BC utilizing a relatively new variation on SSDP reflection/amplification attacks.
- If typical SSDP reflection/amplification attacks are thwarted, DD4BC will shift attack modes from sending M-Search enumeration queries (thus stimulating M-Search enumeration responses to DDoS the target) to issuing spoofed requests to specific SSDP-gatewayed services running on the private LANs of abusable SSDP CPE devices.
- This stimulates the services running behind the CPE devices to respond with HTTP/U packets of ~300 – 500 bytes, sourced from ephemeral ports on the abusable CPE, targeting the destination port of the attacker’s choice.

Typical SSDP Reflection/Amplification Attack

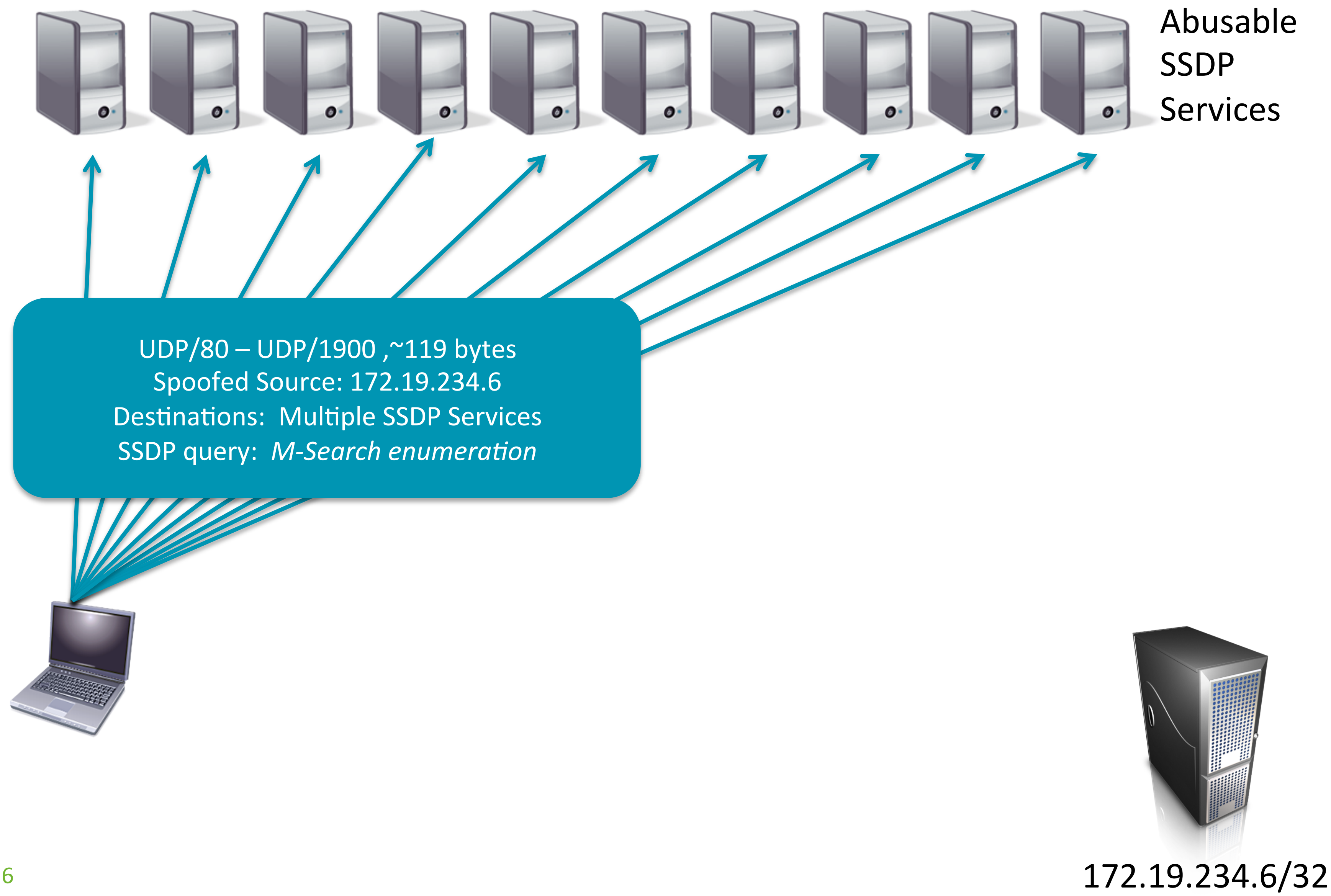


Abusable SSDP Services

Internet-Accessible CPE devices, old Windows XP boxes, etc.

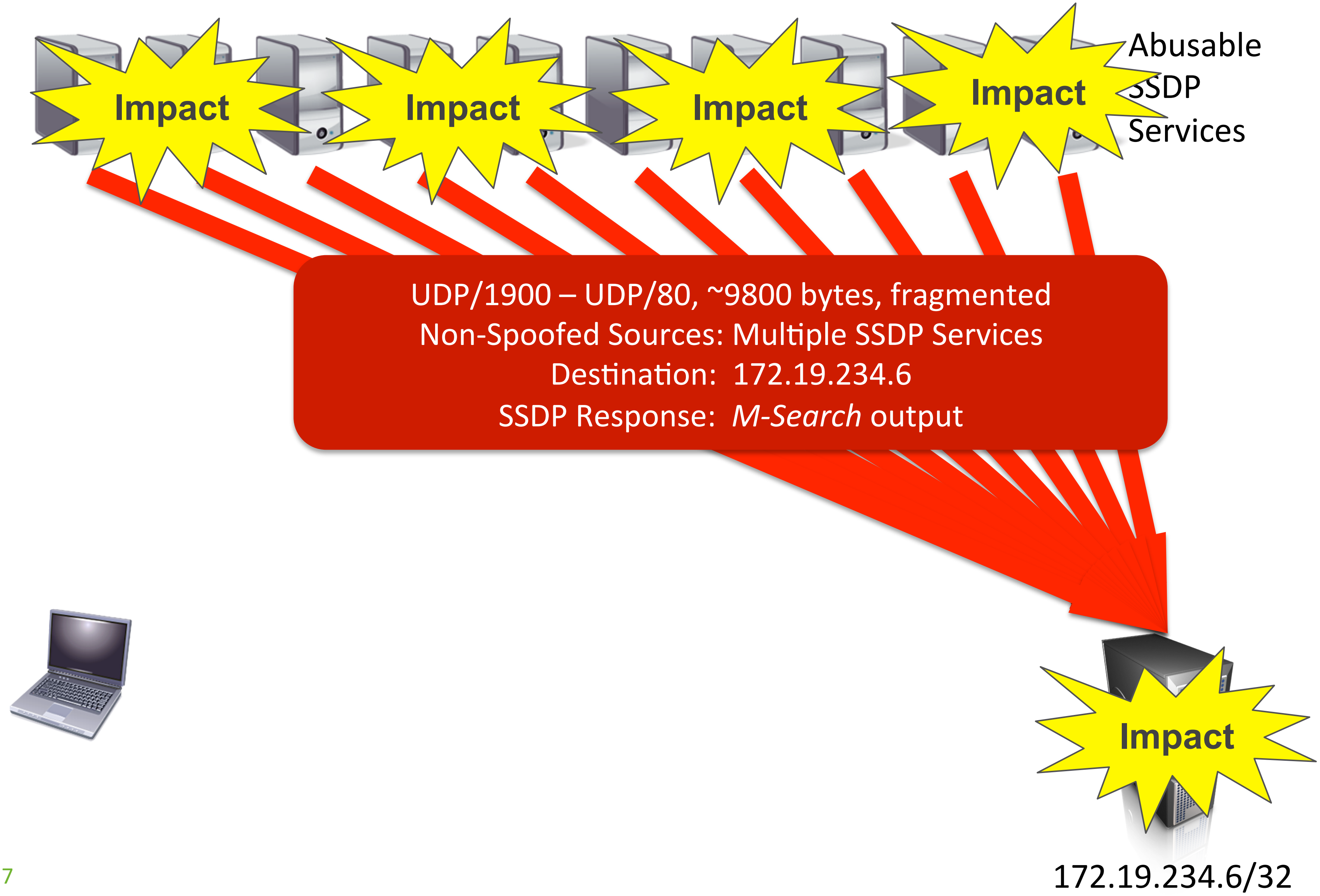
172.19.234.6/32

Typical SSDP Reflection/Amplification Attack



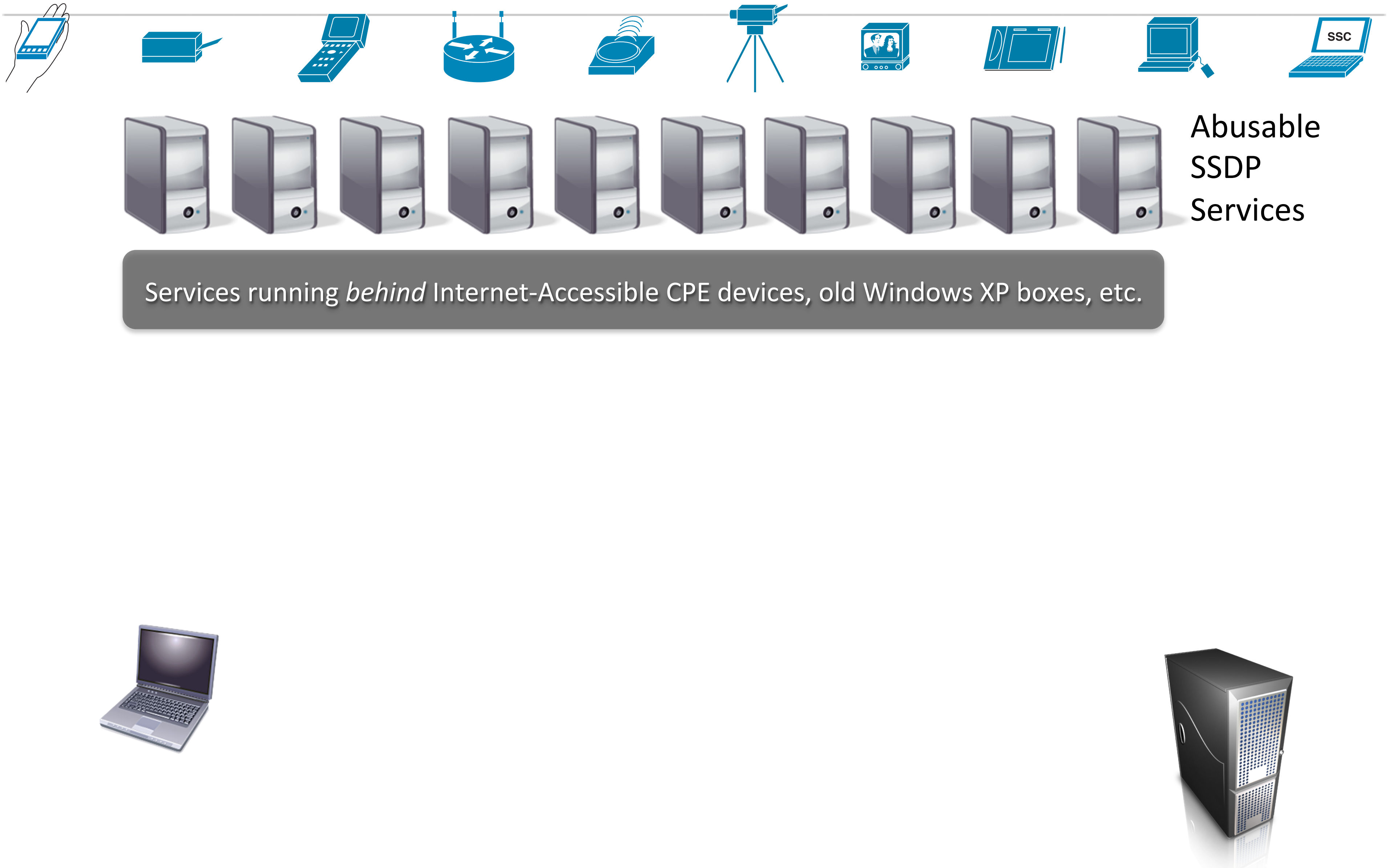
UDP/80 – UDP/1900 ,~119 bytes
Spoofed Source: 172.19.234.6
Destinations: Multiple SSDP Services
SSDP query: *M-Search enumeration*

Typical SSDP Reflection/Amplification Attack



UDP/1900 – UDP/80, ~9800 bytes, fragmented
Non-Spoofed Sources: Multiple SSDP Services
Destination: 172.19.234.6
SSDP Response: *M-Search* output

SSDP HTTP/U Services Reflection/Amplification Attack

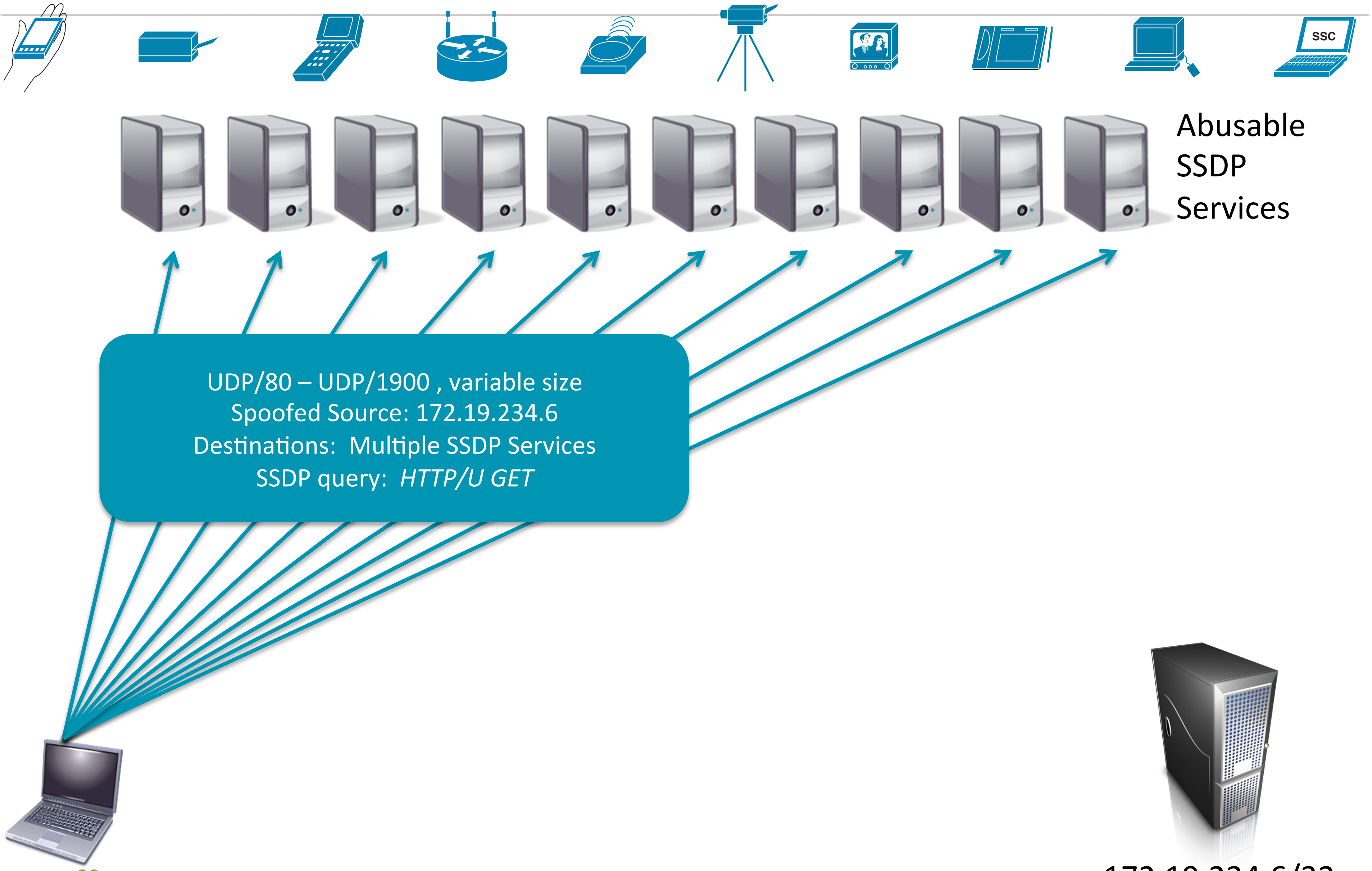


Abusable
SSDP
Services

Services running *behind* Internet-Accessible CPE devices, old Windows XP boxes, etc.

172.19.234.6/32

SSDP HTTP/U Services Reflection/Amplification Attack

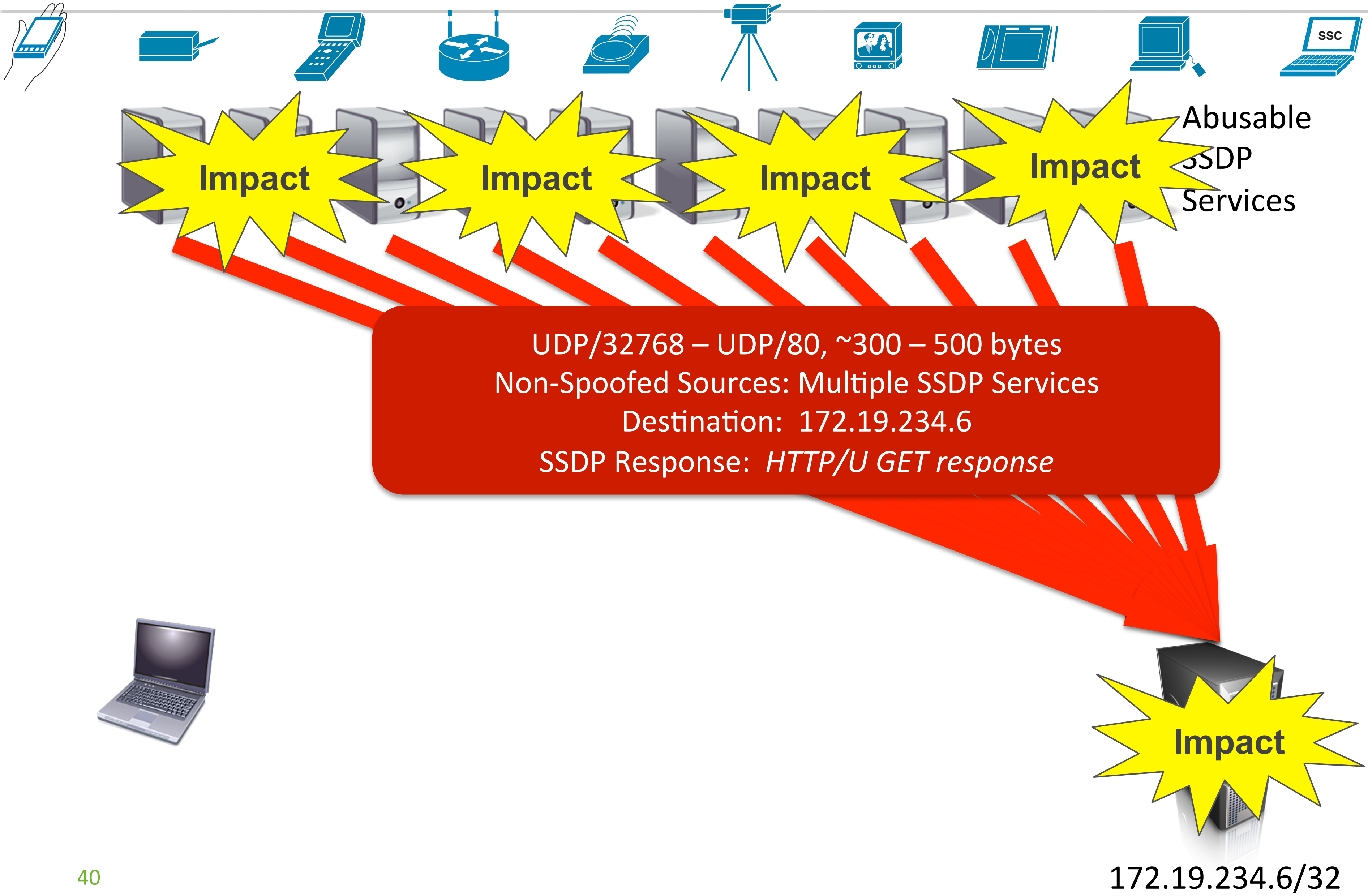


Abusable SSDP Services

UDP/80 – UDP/1900 , variable size
Spoofed Source: 172.19.234.6
Destinations: Multiple SSDP Services
SSDP query: *HTTP/U GET*

172.19.234.6/32

SSDP HTTP/U Services Reflection/Amplification Attack



UDP/32768 – UDP/80, ~300 – 500 bytes
Non-Spoofed Sources: Multiple SSDP Services
Destination: 172.19.234.6
SSDP Response: *HTTP/U GET response*

Layer-7 Decodes of SSDP HTTP/U Responses

```
HTTP/1.1 200 OK

CACHE-CONTROL: max-age=1800

DATE: Fri, 12 Jun 2015 23:09:56 GMT

EXT:

LOCATION: http://192.168.1.1:49154/gatedesc.xml

SERVER: Linux/2.6.34.10_sd5115h_v100f, UPnP/1.0, Portable SDK for UPnP
devices/1.6.6

X-User-Agent: redsonic

ST: uuid:75802409-bccb-40e7-8e6c-fa095ecce13e

USN: uuid:75802409-bccb-40e7-8e6c-fa095ecce13e
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X-User-Agent: redsonic

ST: urn:schemas-upnp-org:device:InternetGatewayDevice:1

USN: uuid:75802409-bccb-40e7-8e6c-fa095ecce13e::urn:schemas-upnp-
org:device:InternetGatewayDevice:1
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org:device:InternetGatewayDevice:1
```

Layer-7 Decodes of SSDP HTTP/U Responses

```
HTTP/1.1 200 OK

CACHE-CONTROL: max-age=100

DATE: Fri, 12 Jun 2015 15:09:04 GMT

EXT:

LOCATION: http://222.208.210.248:49156/TxMediaRenderer_desc.xml

OPT: "http://schemas.upnp.org/upnp/1/0/"; ns=01

01-NLS: 78f69340-1110-11e5-8cd7-cad0e7b6b491

SERVER: 6.1.7601 2/Service Pack 1, UPnP/1.0, Portable SDK for UPnP devices/
1.6.17

X-User-Agent: redsonic

ST: urn:schemas-upnp-org:service:AVTransport:1

USN: uuid:a348ae6e889af22ceade28c7a4551931_MR::urn:schemas-upnp-
org:service:AVTransport:1
```

Layer-7 Decodes of SSDP HTTP/U Responses

```
HTTP/1.1 200 OK

CACHE-CONTROL: max-age=100

DATE: Fri, 12 Jun 2015 15:09:04 GMT

EXT:

LOCATION: http://222.208.210.248:49156/TxMediaRenderer_desc.xml

OPT: "http://schemas.upnp.org/upnp/1/0/"; ns=01

01-NLS: 78f69340-1110-11e5-8cd7-cad0e7b6b491

SERVER: 6.1.7601 2/Service Pack 1, UPnP/1.0, Portable SDK for UPnP devices/
1.6.17

X-User-Agent: redsonic

ST: urn:schemas-upnp-org:service:AVTransport:1

USN: uuid:a348ae6e889af22ceade28c7a4551931_MR::urn:schemas-upnp-
org:service:AVTransport:1
```

Layer-7 Decodes of SSDP HTTP/U Responses

```
HTTP/1.1 200 OK

CACHE-CONTROL: max-age=100

DATE: Fri, 12 Jun 2015 15:09:04 GMT

EXT:

LOCATION: http://222.208.210.248:49156/TxMediaRenderer_desc.xml

OPT: "http://schemas.upnp.org/upnp/1/0/"; ns=01

01-NLS: 78f69340-1110-11e5-8cd7-cad0e7b6b491

SERVER: 6.1.7601 2/Service Pack 1, UPnP/1.0, Portable SDK for UPnP devices/
1.6.17

X-User-Agent: redsonic

ST: urn:schemas-upnp-org:service:AVTransport:1

USN: uuid:a348ae6e889af22ceade28c7a4551931_MR::urn:schemas-upnp-
org:service:AVTransport:1
```

Layer-7 Decodes of SSDP HTTP/U Responses

```
HTTP/1.1 200 OK

CACHE-CONTROL: max-age=100

DATE: Fri, 12 Jun 2015 15:09:04 GMT

EXT:

LOCATION: http://222.208.210.248:49156/TxMediaRenderer_desc.xml

OPT: "http://schemas.upnp.org/upnp/1/0/"; ns=01

01-NLS: 78f69340-1110-11e5-8cd7-cad0e7b6b491

SERVER: 6.1.7601 2/Service Pack 1, UPnP/1.0, Portable SDK for UPnP devices/1.6.17

X-User-Agent: redsonic

ST: urn:schemas-upnp-org:service:AVTransport:1

USN: uuid:a348ae6e889af22ceade28c7a4551931_MR::urn:schemas-upnp-org:service:AVTransport:1
```

Layer-7 Decodes of SSDP HTTP/U Responses

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HTTP/1.1 200 OK

CACHE-CONTROL: max-age=100

DATE: Fri, 12 Jun 2015 15:09:04 GMT

EXT:

LOCATION: http://222.208.210.248:49156/TxMediaRenderer_desc.xml

OPT: "http://schemas.upnp.org/upnp/1/0/"; ns=01

01-NLS: 78f69340-1110-11e5-8cd7-cad0e7b6b491

SERVER: 6.1.7601 2/Service Pack 1, UPnP/1.0, Portable SDK for UPnP devices/
1.6.17

X-User-Agent: redsonic

ST: urn:schemas-upnp-org:service:AVTransport:1

USN: uuid:a348ae6e889af22ceade28c7a4551931_MR::urn:schemas-upnp-
org:service:AVTransport:1
```

Layer-7 Decodes of SSDP HTTP/U Responses

```
HTTP/1.1 200 OK

CACHE-CONTROL: max-age=1800

DATE: Fri, 12 Jun 2015 15:09:57 GMT

EXT:

LOCATION: http://169.254.39.32:49152/wps_device.xml

SERVER: Unspecified, UPnP/1.0, Unspecified

ST: urn:schemas-wifialliance-org:service:WFAWLANConfig:1

USN: uuid:56eb2067-c465-582f-b238-6cb0ce1987f1::urn:schemas-wifialliance-
org:service:WFAWLANConfig:1
```

Layer-7 Decodes of SSDP HTTP/U Responses

```
HTTP/1.1 200 OK

CACHE-CONTROL: max-age=1800

DATE: Fri, 12 Jun 2015 15:09:57 GMT

EXT:

LOCATION: http://169.254.39.32:49152/wps_device.xml

SERVER: Unspecified, UPnP/1.0, Unspecified

ST: urn:schemas-wifialliance-org:service:WFAWLANConfig:1

USN: uuid:56eb2067-c465-582f-b238-6cb0ce1987f1::urn:schemas-wifialliance-
org:service:WFAWLANConfig:1
```

Layer-7 Decodes of SSDP HTTP/U Responses

```
HTTP/1.1 200 OK

CACHE-CONTROL: max-age=1800

DATE: Fri, 12 Jun 2015 15:09:57 GMT

EXT:

LOCATION: http://169.254.39.32:49152/wps_device.xml

SERVER: Unspecified, UPnP/1.0, Unspecified

ST: urn:schemas-wifialliance-org:service:WFAWLANConfig:1

USN: uuid:56eb2067-c465-582f-b238-6cb0ce1987f1::urn:schemas-wifialliance-
org:service:WFAWLANConfig:1
```

DD4BC in Australia & New Zealand

DD4BC Attacks in Australia and New Zealand

- There were several DD4BC-related DDoS attacks in Australia and New Zealand in May and June of 2015.
- Financial institutions and online commerce sites were the main targets.
- The largest verified DD4BC-related DDoS attack in Australia was ~60gb/sec – this matches the maximum demonstrated attack volume DD4BC has launched, to date.
- The largest verified DD4BC-related DDoS attack in New Zealand was ~8gb/sec.
- These were mainly SSDP and ntp reflection/amplification DDoS attacks, with some SYN-flooding, as well.

Who or What is DD4BC?

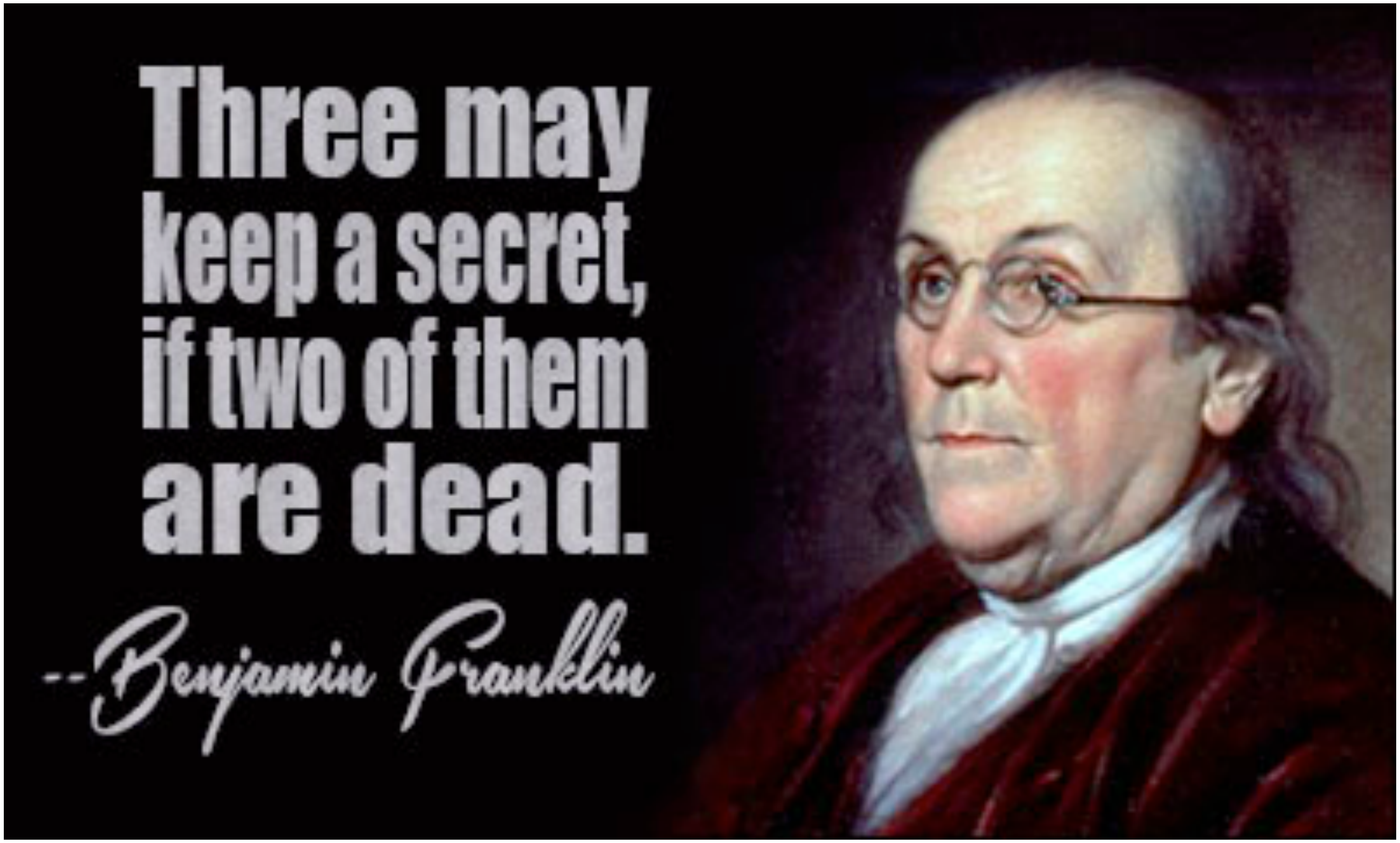
What Do We Think We Know About DD4BC?

- Based on the language used in DD4BC extortion threat email messages, we believe DD4BC is fluent in English, but English isn’t DD4BC’s primary language.
- DD4BC has demonstrated ignorance of the US Fourth of July holiday, sending repeated extortion demands to US-based financial institutions during this long weekend. As this is the most well-known US holiday apart from Christmas/New Year’s Day, it is unlikely DD4BC is familiar with American culture.
- The fact that DD4BC only appears to attack one target at a time indicates that DD4BC may well be a single individual. DD4BC remaining at large also tends to support this theory.
- DD4BC is reasonably tech-savvy (Bitcoin, DDoS attacks), but does not appear to be a high-level technical expert – hence, the reliance on booter/stresser services.
- DD4BC does not seem to fully realize that attacking financial institutions attracts the attention of LEAs far more than attacking Bitcoin-related sites and online gambling/casino organizations

Why Hasn’t DD4BC Been Caught?

- Reasonably good operational security – no bragging (this is how the few DDoSers who are caught give themselves away, in most cases)
- Started out attacking ‘fringe’ organizations – online casinos, lottos, sports betting shops. LEA in many jurisdictions don’t always put a high priority on attacks against these types of organizations.
- Attacks are distributed across many geographies and countries.
- DD4BC is willing to cut losses and abandon attacks against well-defended targets, is not generally very persistent.
- Despite claims of 400gb/sec of DDoS attack traffic capacity, largest known DD4BC attack volume is 60gb/sec – this is non-trivial, but does not always choke peering links, disrupt bystander traffic, etc.
- DD4BC attacks tend to be sporadic, both jurisdictionally and chronologically. One target at a time.
- If DD4BC is an individual, this would also contribute to avoiding capture, assuming no bragging/loose lips.

Why Hasn't DD4BC Been Caught?



DD4BC Today & Tomorrow

Imitation is the Most Sincere Form of Flattery

- DD4BC has gained enough notoriety (in part because of its longevity and broadening its target base to the financial sector) that there are several DD4BC copycats operating.
- Analysis of the copycat extortion threat emails makes it clear that these email messages were not composed by the original DD4BC, and that whoever composed them is not as fluent in English as is DD4BC.
- The DD4BC copycats have also resorted to posting DDoS extortion threat targets and attack timetables (shades of Operation Ababil) on Pastebin and regional Pastebin-equivalent sites.
- The SSDP variant attack utilized by DD4BC is not known to have been utilized by DD4BC copycats, to date.

Projected Evolution of DD4BC

- As booter/stresser DDoS attack methodologies expand, DD4BC will likely take advantage of them, as with the WordPress XMLRPC pingback attacks and the SSDP HTTP/U services attack variant.
- DD4BC will likely target more organizations in Asia, though the language barrier will likely limit the efficacy of doing so.
- The same holds true of Latin/South America and Africa – language will be an impediment.
- DD4BC will likely expand to other verticals.
- DD4BC may begin employing indirect attack vectors.
- DD4BC has gained the attention of LEAs, intelligence agencies, security researchers, and closed opsec groups worldwide.
- If DD4BC persists in attacking financial institutions, the likelihood of identification and capture is far higher than DD4BC seems to realize.

Defending Against DD4BC

All the Usual Recommendations, and Then Some

- Network infrastructure, server/service/application BCPs.
- Situationally-appropriate network access policies – e.g., ACLs – will keep out-of-profile attack traffic off servers, can be forward-emplaced on customer aggregation routers, mitigation center diversion gateways, etc.
- Organizations must have the ability to detect/classify/traceback DDoS attack traffic – flow telemetry.
- S/RTBH, flowspec, IDMS as reaction tools.
- If an extortion email is received, contact LEAs, ISPs, MSSPs immediately; share with appropriate vertical orgs and opsec groups.
- Simulate language difficulties, unfamiliarity with Bitcoin, etc. to buy time while contacting LEAs
- Do not pay!

Conclusion

Conclusions

- DD4BC is prolific, long-running.
- DD4BC is reasonably skilled.
- DD4BC has reasonably good operational security.
- Monitors attacks and reacts to defensive measures.
- Knows when to cut losses.
- Is probably not American.
- May be an individual.

Conclusions (cont.)

- Standard BCPs and detection/classification/traceback/mitigation techniques work well against DD4BC DDoS attacks.
- Attack capacity maxes at ~60gb/sec, so far.
- Gradually adopts new DDoS vectors as booters/stressers support.
- Has aroused the focus of LEA, intelligence, security groups worldwide.
- Will go away if reasonable DDoS defensive measures are taken.
- Can be defeated!

Discussion

This Presentation – http://bit.ly/1F0Nfrc

Special thanks to Curt Wilson, Darren Anstee, and C.F. Chui of Arbor Networks for their contributions to this presentation.

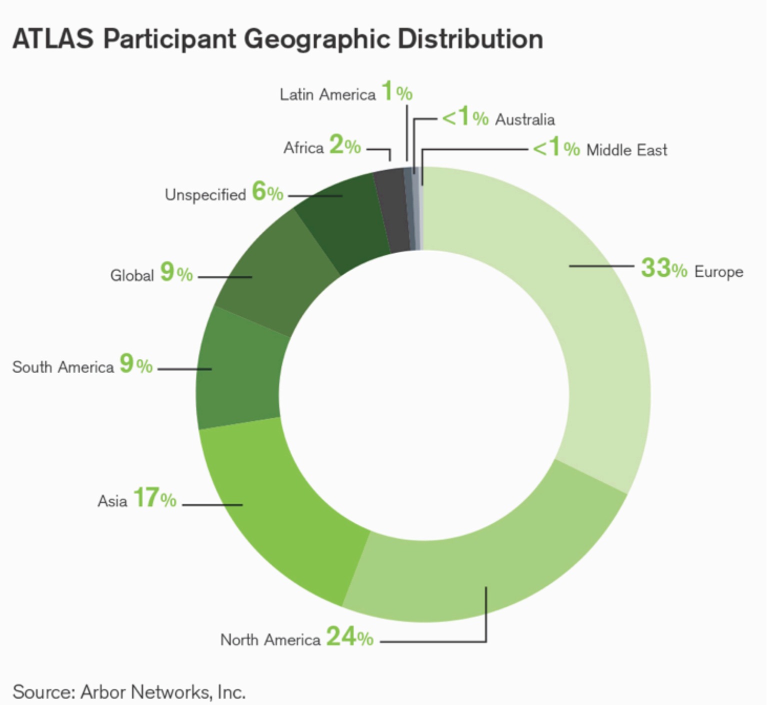
Thank You!

Roland Dobbins <rdobbins@arbor.net>
Principal Engineer, ASERT

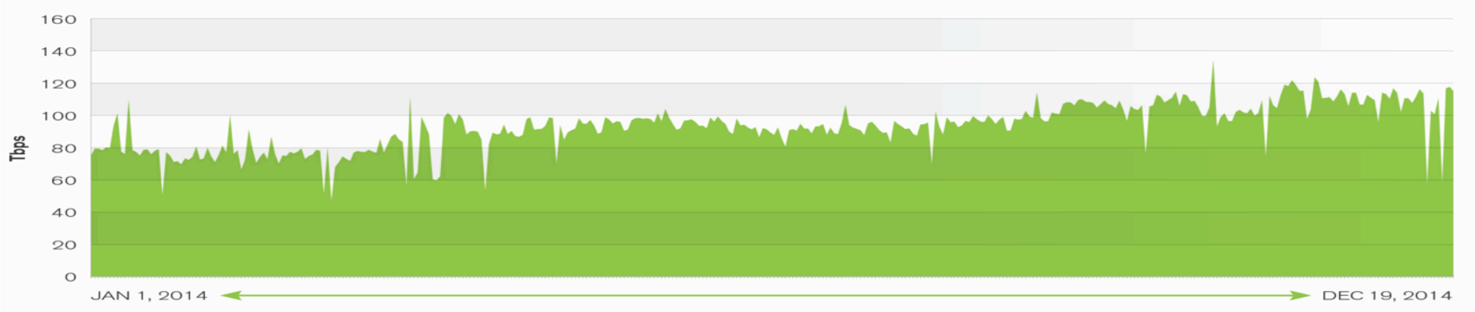
Australia DDoS Stats – 2015Q1/Q2

ATLAS Demographics

- Provides invaluable data to the global operational security community
- Currently monitors between 25~30% of Internet traffic
- Provides data to the Google Digital Attack Map
- 330+ participating customers
  - 32% Europe
  - 24% North America
  - 17% Asia/Oceania
  - 9% South America
  - 9% Global

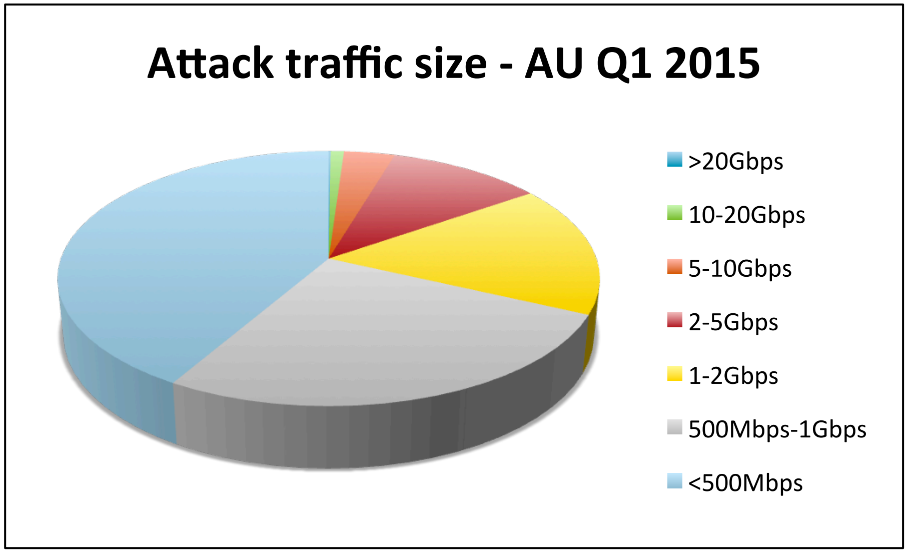


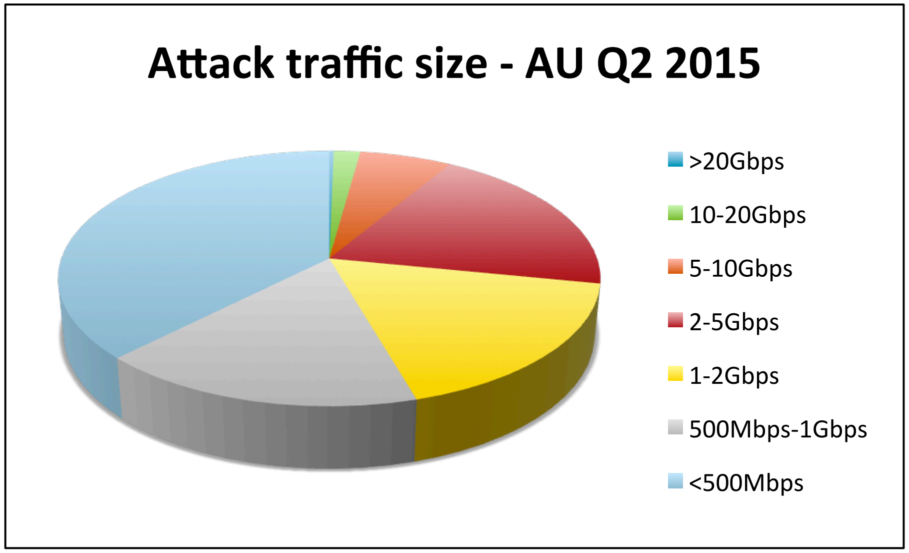
Source: Arbor Networks, Inc.



2015 ATLAS : Attack traffic sizes AU

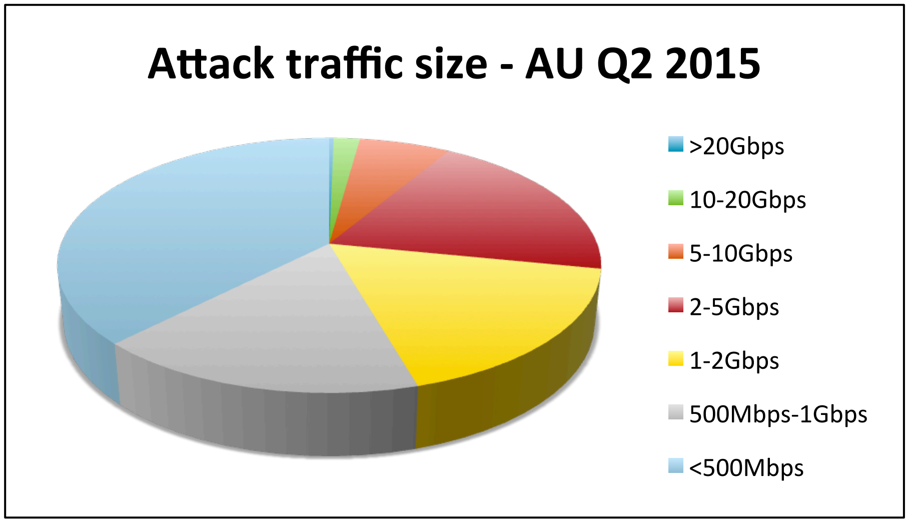
- Average attack size increased in Q2 2015
- > 28% of attacks larger than 2 Gbps

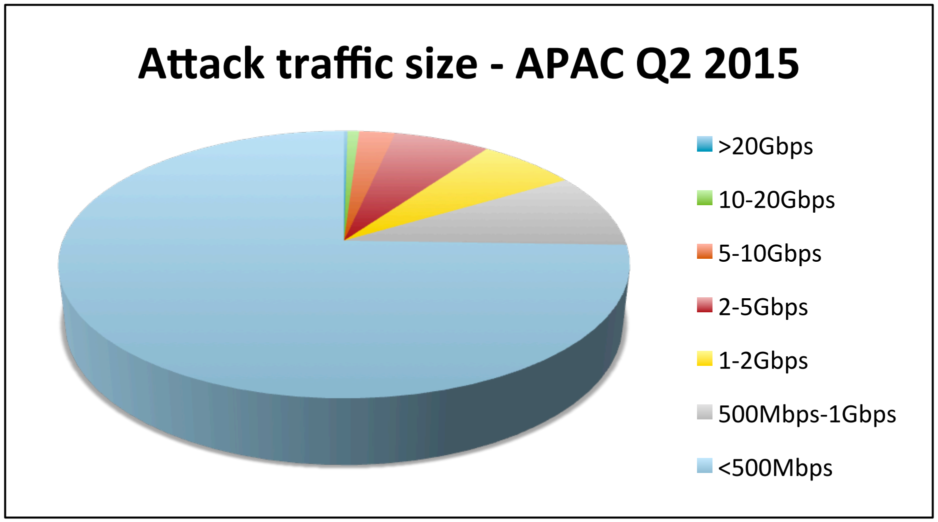




	AU Average	APAC Average
Q1 15	1.25Gbps/345.94Kpps	483.65Mbps/152.58Kpps
Q2 15	1.83Gbps/501.78Kpps	800.01Mbps/264.71Kpps

2015 ATLAS : Attack traffic sizes AU





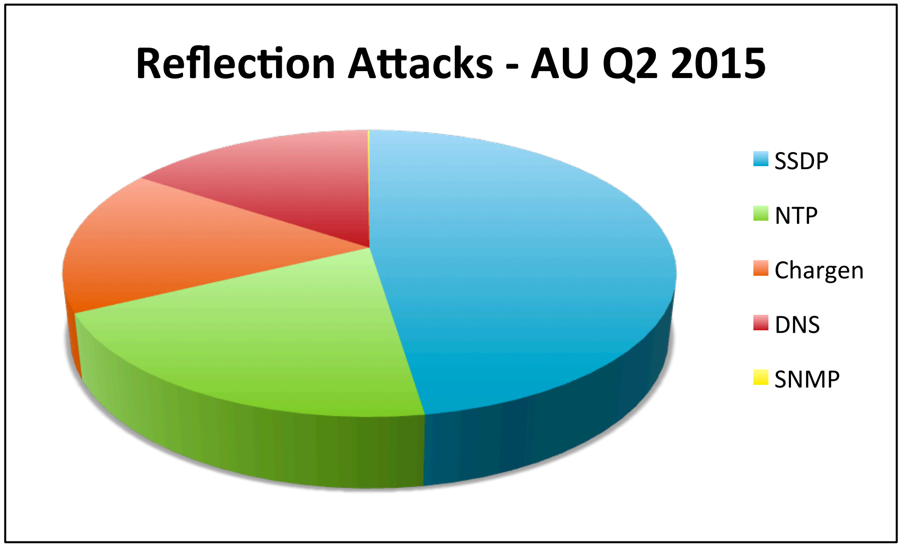
- AU has higher proportion of attacks > 1Gbps compared to APAC numbers
  - Q2 2015 AU 45% vs APAC 17%

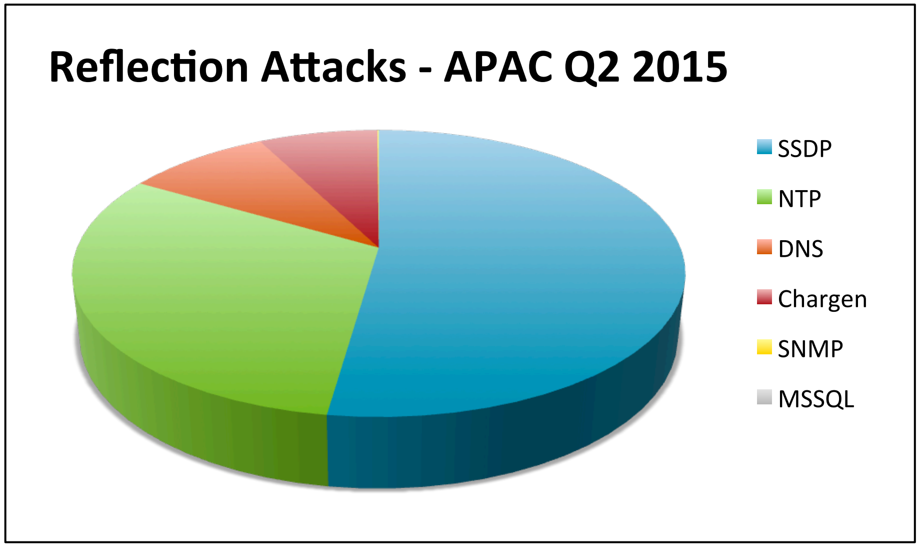
	AU Peak	APAC Peak
Q1 15	74.12Gbps/14.75Mpps, UDP flooding attack	334.22Gbps/29.13Mpps to India, reflection attack
Q2 15	136.91Gbps/11.64Mpps, reflection attack	144.91Gbps/53.62Mpps to China, SSDP reflection attack

2015 Reflection/Amplification Attacks in AU

Reflection/Amplification Attack Analysis

- SSDP (48%) tops the list of reflection/amplification attacks in Q2 2015.
- The largest reflection/amplification attack was 42gb/sec NTP reflection/ amplification attack targeted at UDP/80


Reflection Attacks - AU Q2 2015


Reflection Attacks - APAC Q2 2015

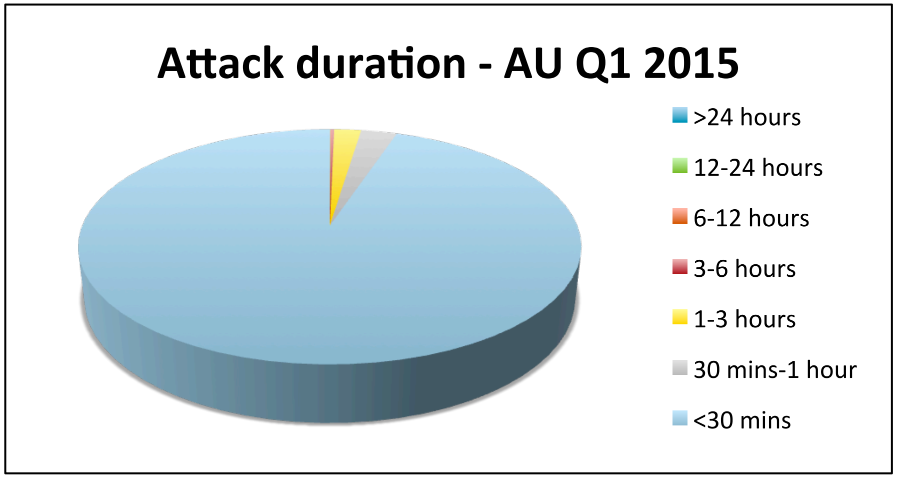
2015 ATLAS : Attack Durations in AU

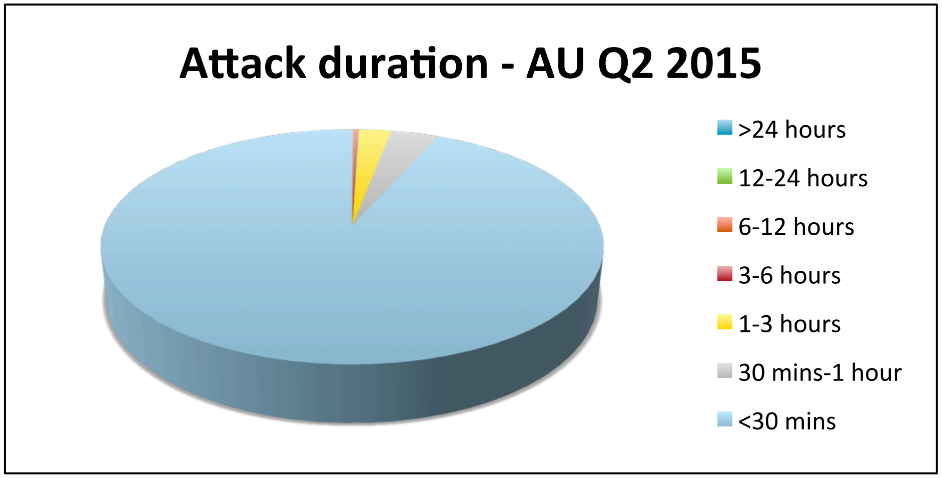
Duration Break-Out Q1 2015

- Majority of attacks short-lived, ~98% less than 1 hour
- Average attack duration 22 min 16 sec
- Proportion of attacks lasting longer than 12 hours is < 0.1%

Duration Break-Out Q2 2015

- Majority of attacks short-lived, ~97% less than 1 hour
- Average attack duration 23 min 46 sec
- Proportion of attacks lasting longer than 12 hours is < 0.1%

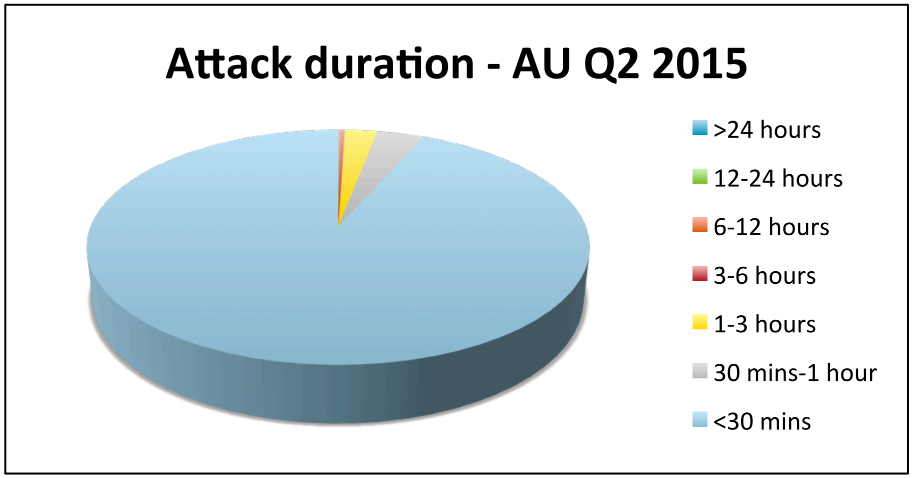


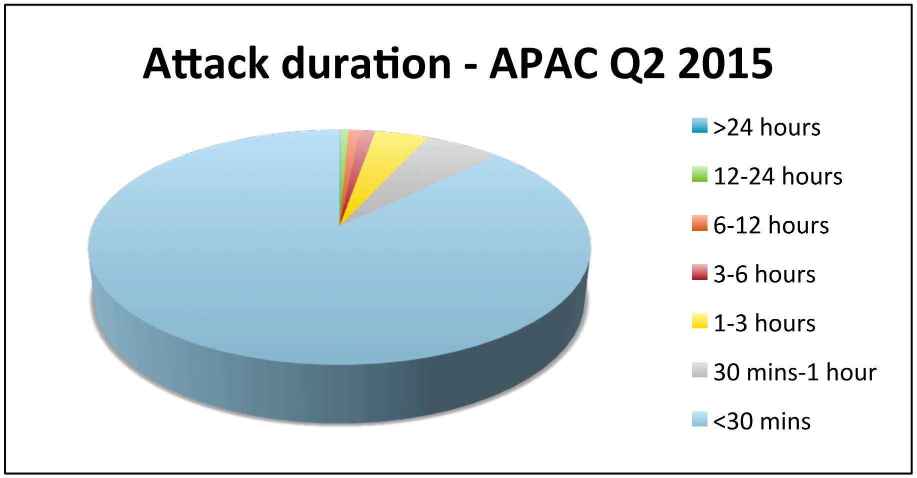


2015 ATLAS : Attack Durations in AU

Duration Break-Out (Q2 2015)

	AU Average	APAC Average
Average duration	23 min 46 sec	39 min 53 sec
> 12 hours	< 0.1%	1%
< 1 hour	97%	93%





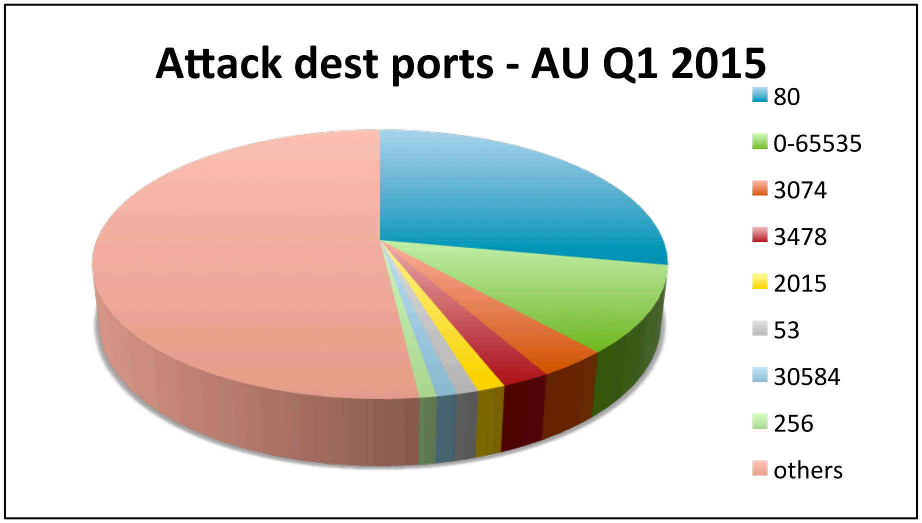
2015 ATLAS : Attack destination ports AU

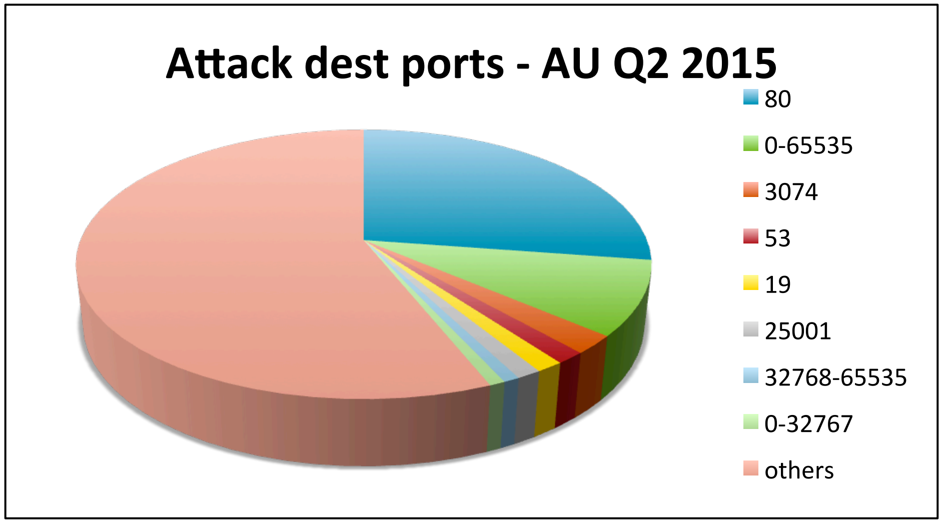
Dest Port/Proto Breakdown, Q1 2015

- UDP/80 at number 1, with 28% of events
- Random ports at number 2, with 10% of events
- UDP/3074 at number 3, with 3% of events

Dest Port/Proto Breakdown, Q2 2015

- UDP/80 at number 1, with 27% of events
- Random ports at number 2, with 9% of events
- UDP/3074 at number 3, with 2% of events

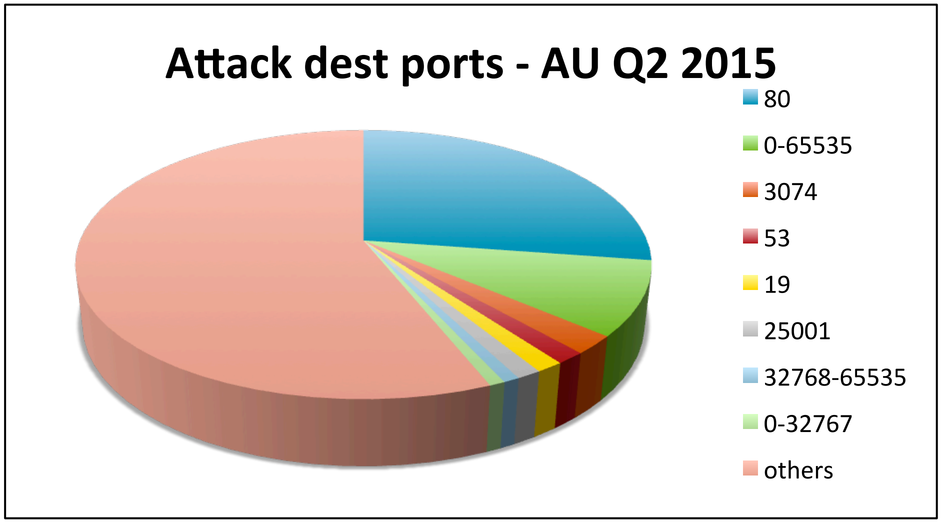


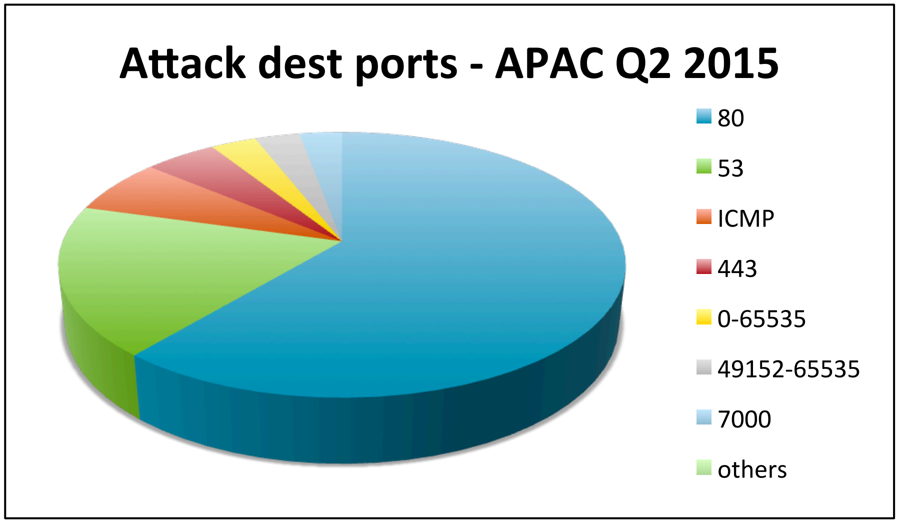


2015 ATLAS : Attack Destination Ports/Protos AU

Dest Port Breakdown (Q2 2015)

	AU	APAC
Top #1	UDP/80 (27%)	UDP/80 (61%)
Top #2	Random (9%)	UDP/53 (18%)
Top #3	UDP/3074 (2%)	ICMP PING (7%)





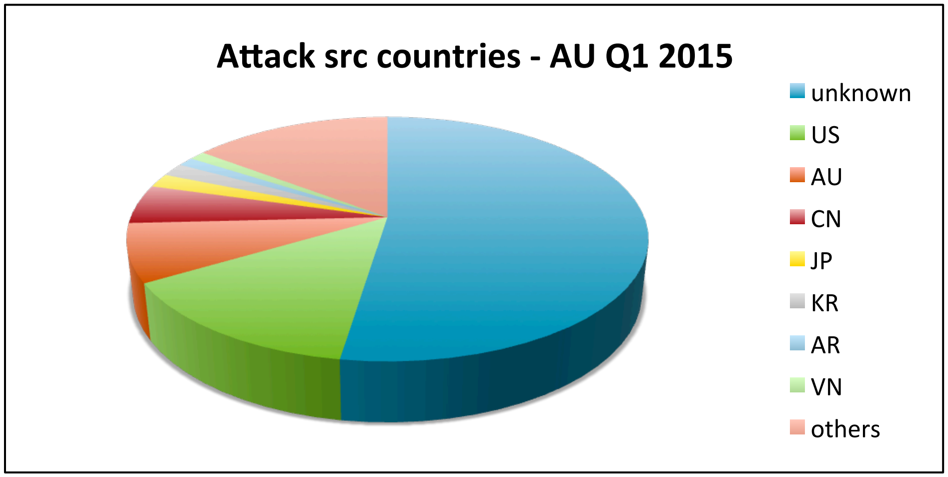
2015 ATLAS : Attack Source Countries AU

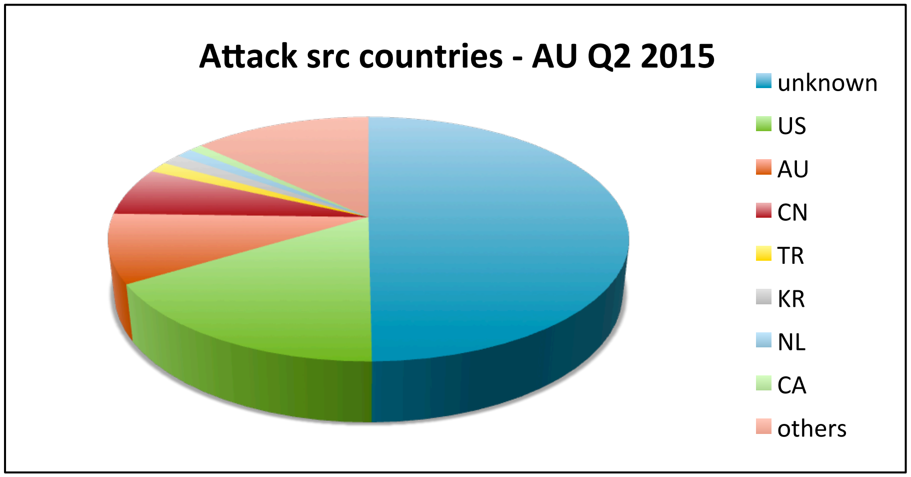
Source Breakdown, Q1 2015

- 52% of monitored events cannot be attributed due to data anonymisation / distribution
- Of the remaining 48%, the top 3 sources are:
  - US : 14%
  - AU : 8%
  - CN : 5%

Source Breakdown, Q2 2015

- 55% of monitored events cannot be attributed due to data anonymisation / distribution
- Of the remaining 45%, the top 3 sources are:
  - US : 17%
  - AU : 9%
  - CN : 6%

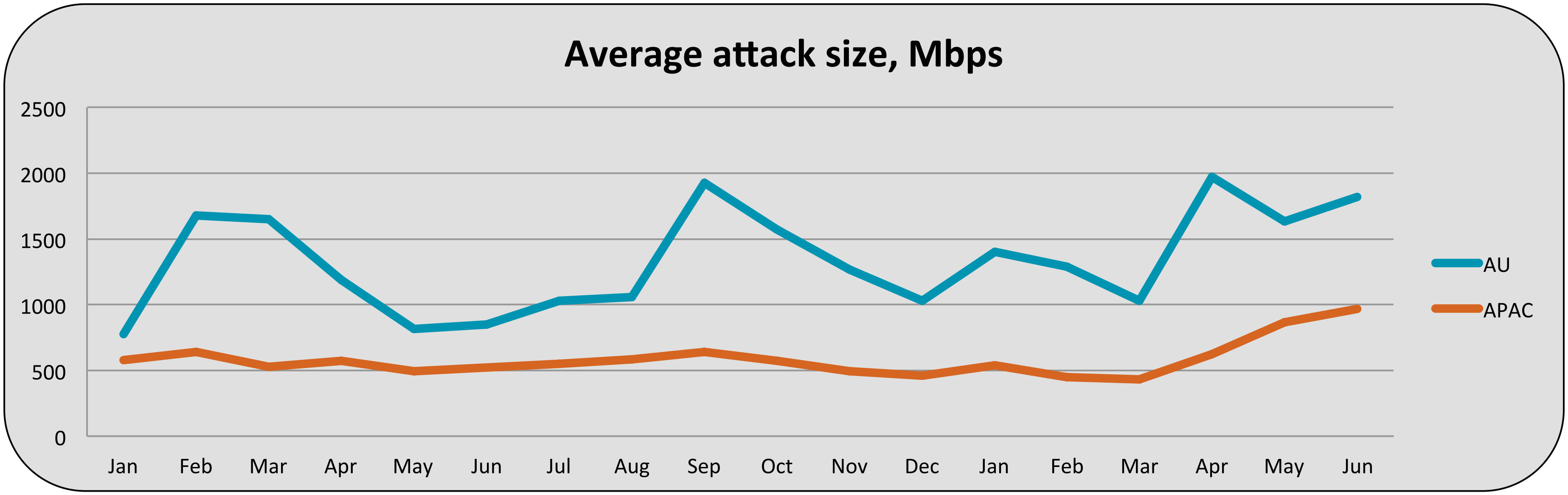




2015 ATLAS : Average Attack Sizes AU

Average Attack Sizes, Month-by-Month

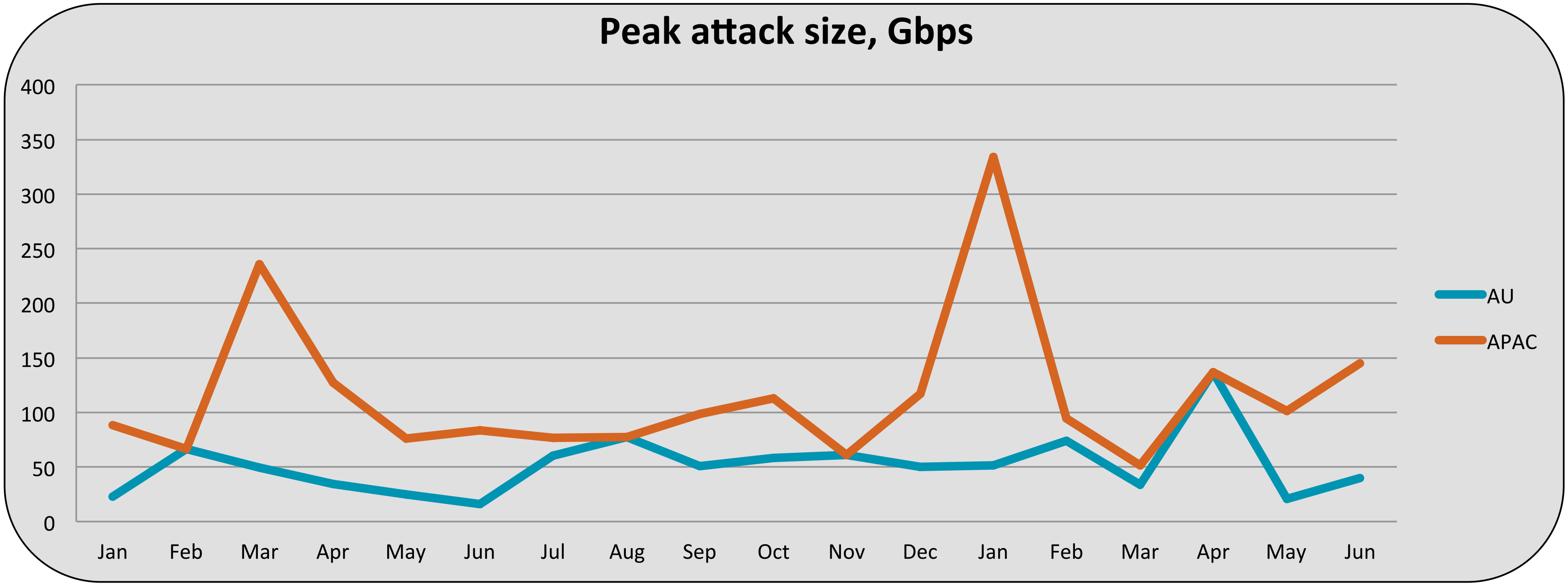
- APAC average attack size slowly increased in last quarter
- AU average attack size is larger (2x) than the APAC average



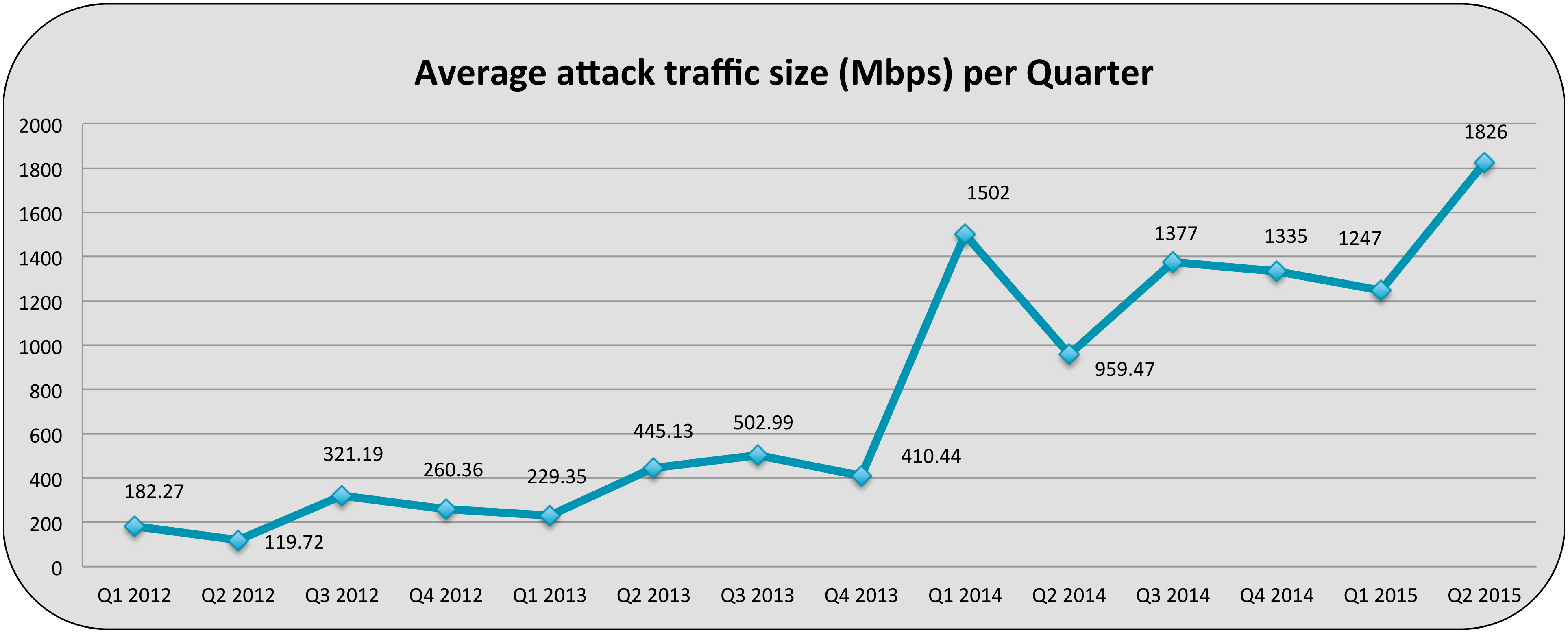
2015 ATLAS : Peak Attack Sizes AU

Peak Attack Sizes, Month-by-Month

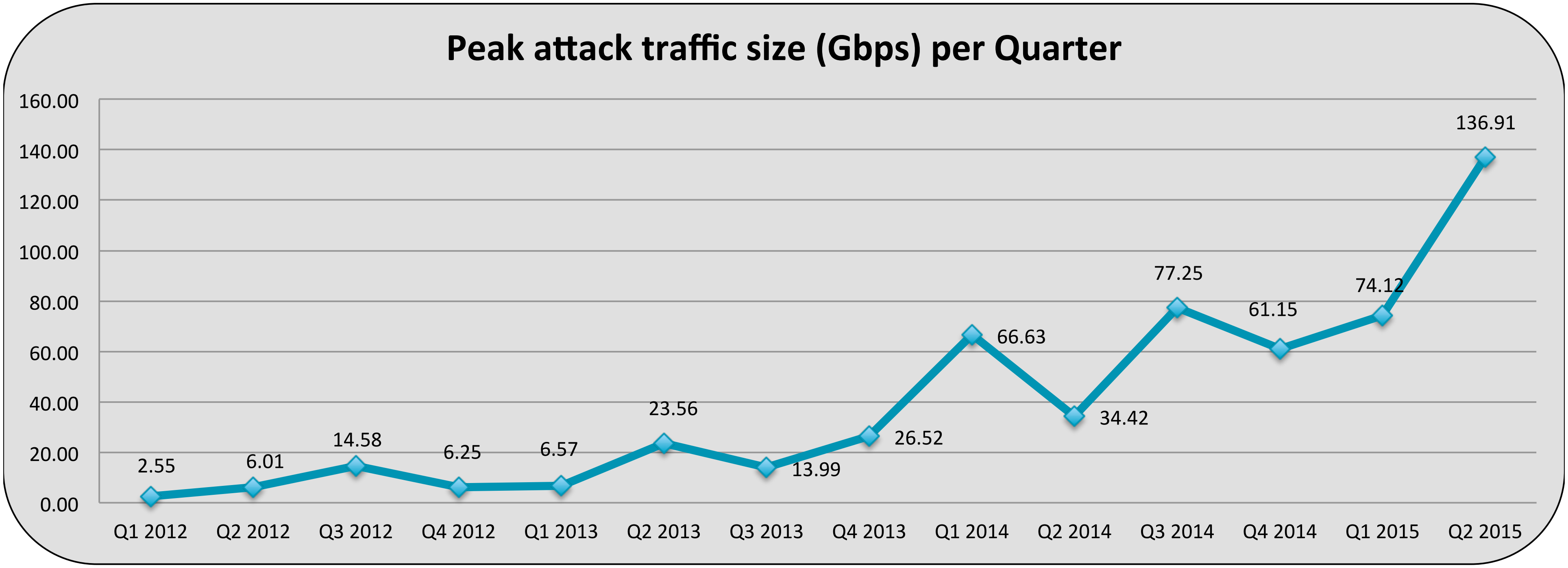
- Peak attack sizes in Australia are generally lower than the APAC peak
- April 2015 - the largest attack in APAC targeted Australia



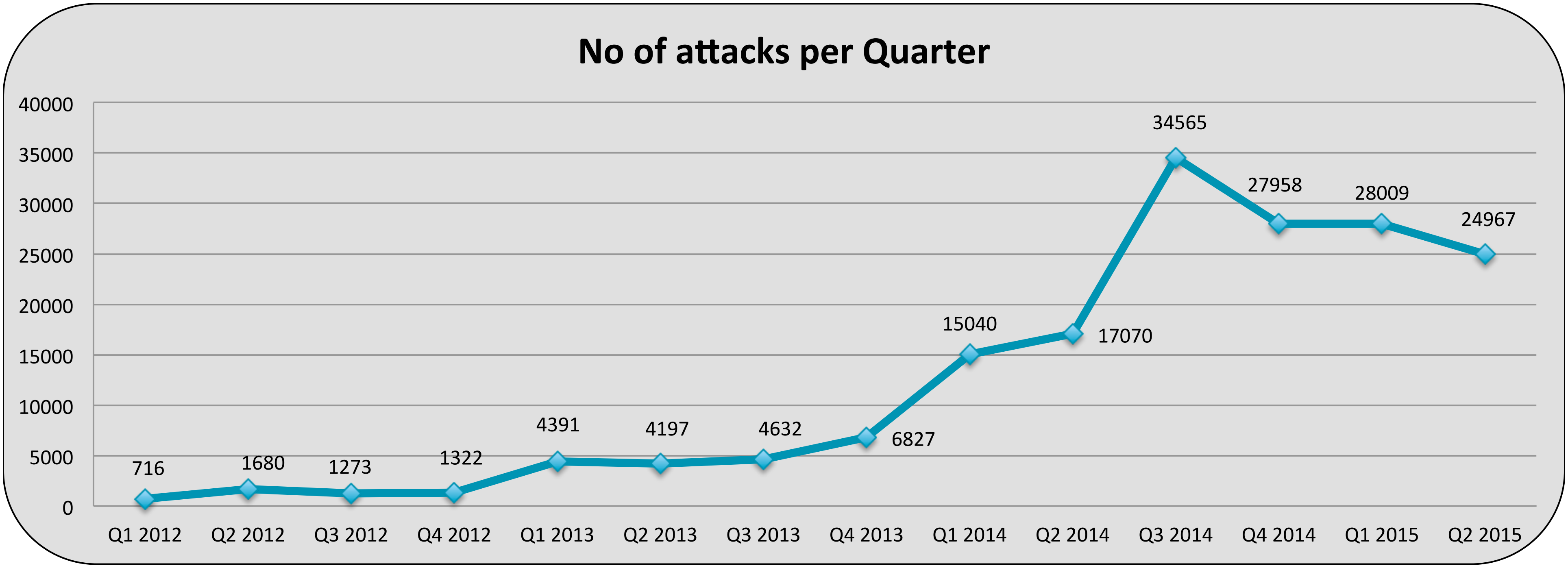
ATLAS : Average Attack Sizes AU



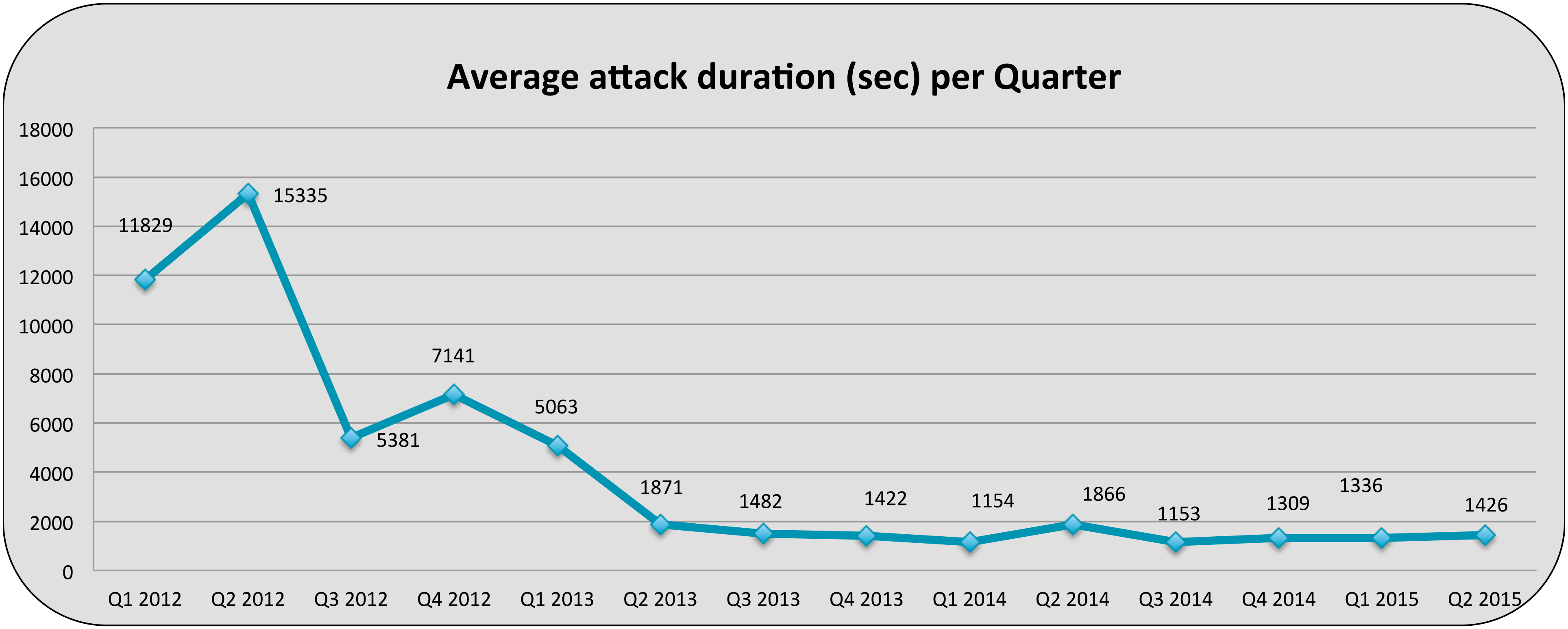
ATLAS : Peak Attack Sizes AU



ATLAS : Number of Attacks in AU



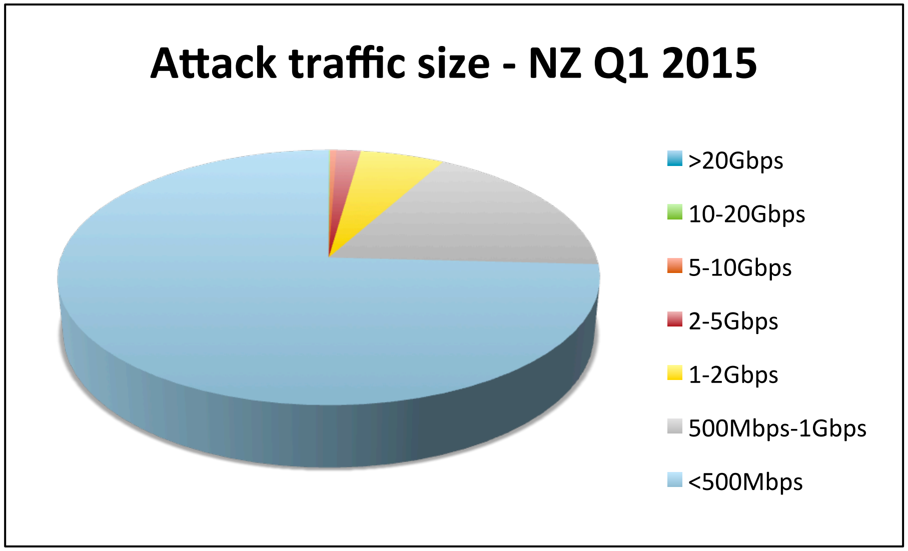
ATLAS : Average Attack Duration AU

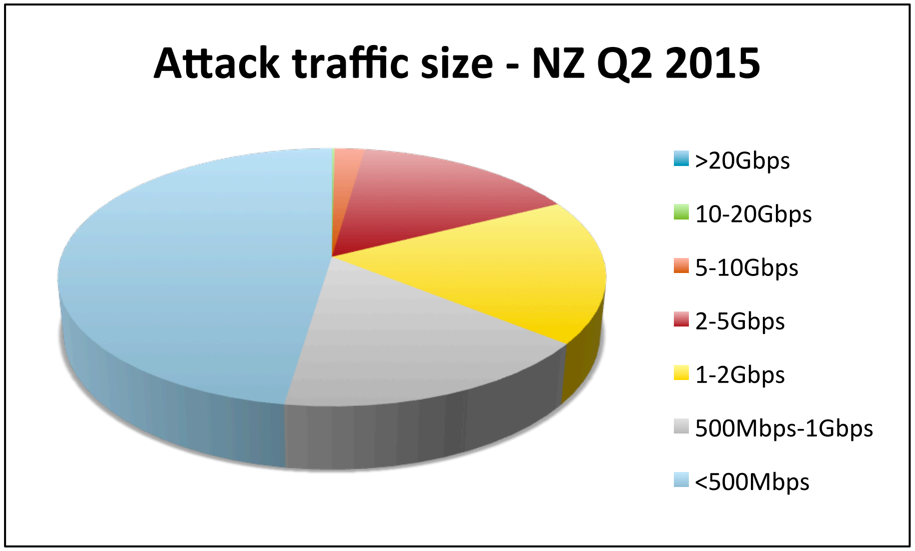


New Zealand DDoS Stats – 2015Q1/Q2

2015 ATLAS : Attack Traffic Size in NZ

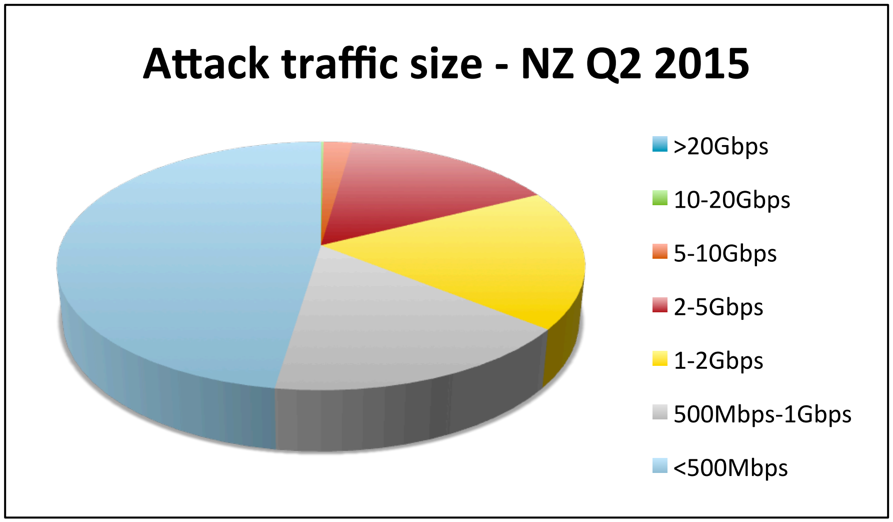
- Average attack size increased significantly from Q1 2015 to Q2 2015

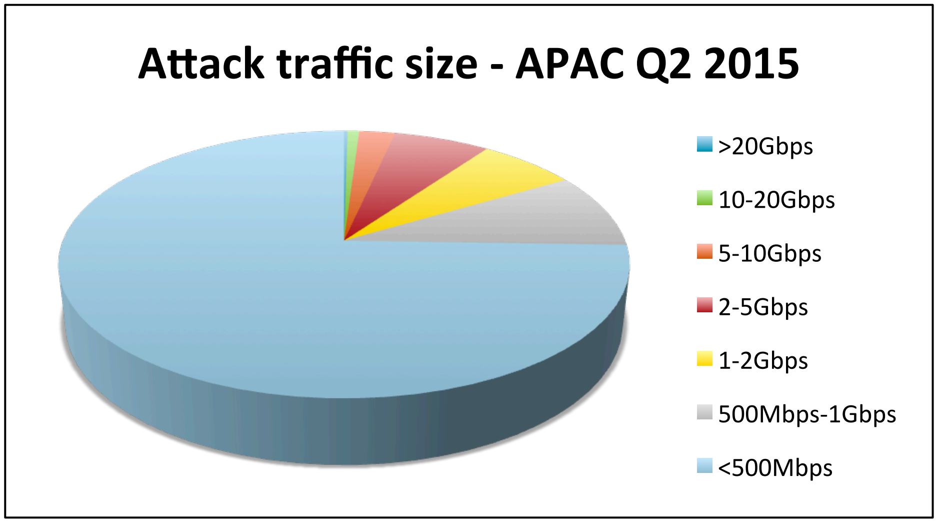




	NZ Average	APAC Average
Q1 15	430.84Mbps/55.39Kpps	483.65Mbps/152.58Kpps
Q2 15	1.1Gbps/241.95Kpps	800.01Mbps/264.71Kpps

2015 ATLAS : Attack Traffic Size in NZ


Attack traffic size - NZ Q2 2015


Attack traffic size - APAC Q2 2015

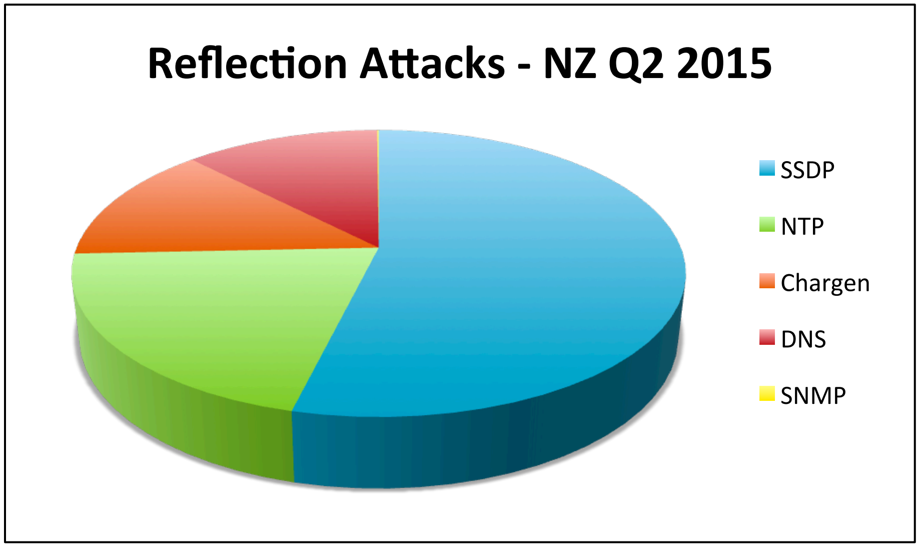
- NZ has higher proportion of attacks > 1Gbps compared to APAC numbers
  - Q2 2015 NZ 35% vs APAC 17%

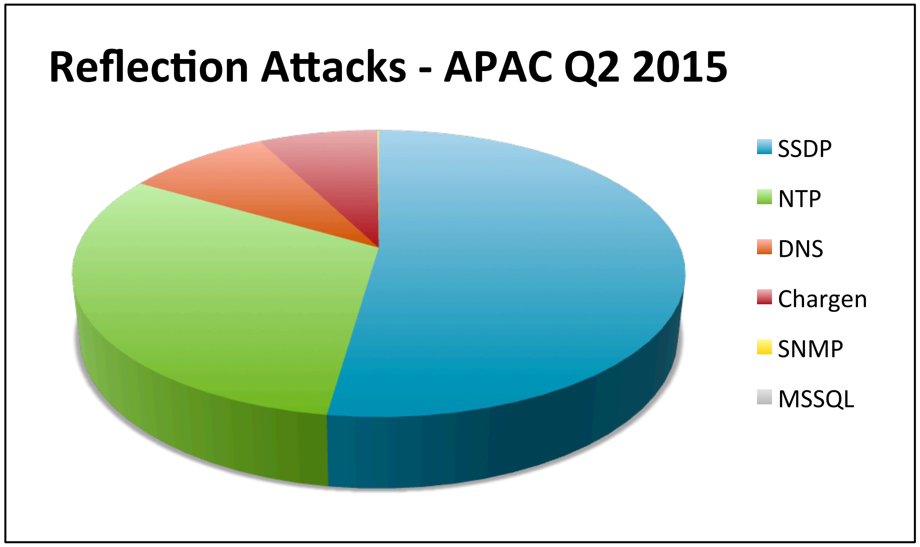
	NZ Peak	APAC Peak
Q1 15	26.21Gbps/2.88Mpps, reflection attack	334.22Gbps/29.13Mpps to India, reflection attack
Q2 15	28.16Gbps/3.12Mpps, reflection attack	144.91Gbps/53.62Mpps to China, SSDP reflection attack

2015 ATLAS : Reflection/Amplification in NZ

Reflection/Amplification Attack Analysis

- SSDP tops the list in Q2 2015.
- Largest reflectionamplification attack was 16.69gb/sec (chargen) targeted at UDP/60806





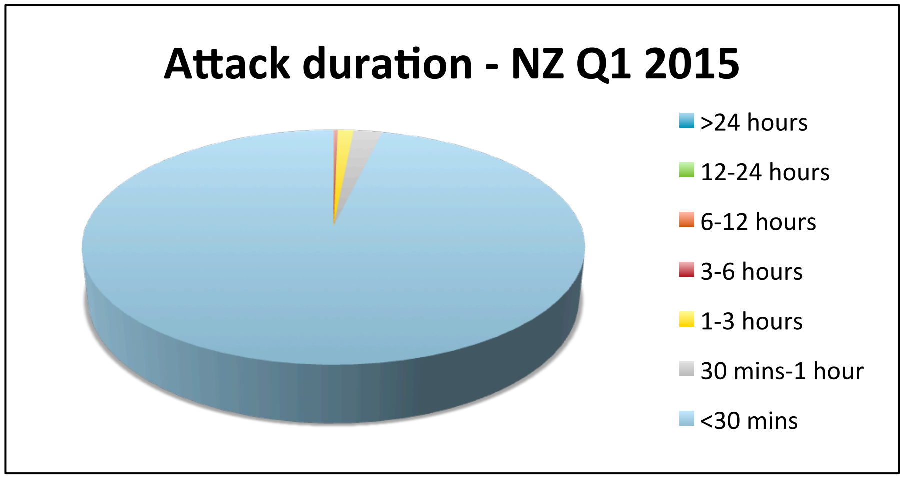
2015 ATLAS : Attack Durations in NZ

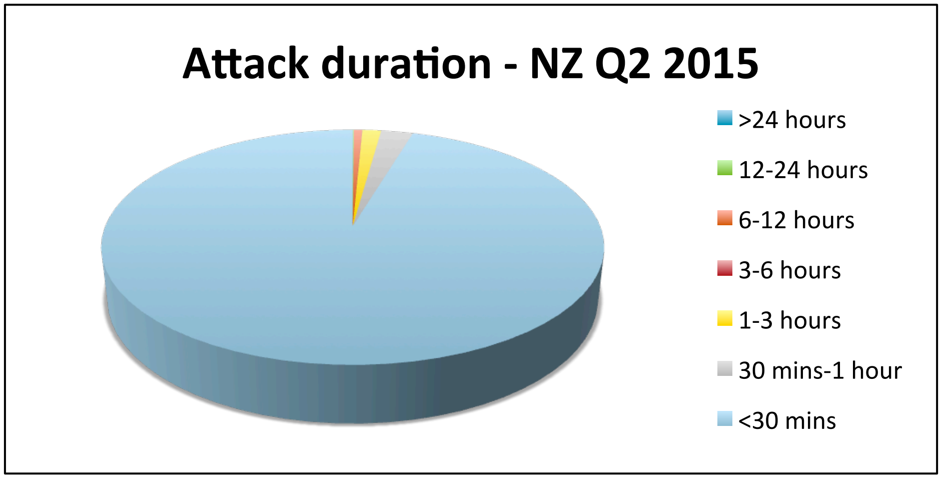
Duration Breakdown Q1 2015

- Majority of attacks short-lived, ~98% less than 1 hour
- Average attack duration 12m 40s
- Proportion of attacks lasting longer than 12 hours is < 0.1%

Duration Breakdown Q2 2015

- Majority of attacks short-lived, ~97% less than 1 hour
- Average attack duration 15m 39s
- Proportion of attacks lasting longer than 12 hours is < 0.1%

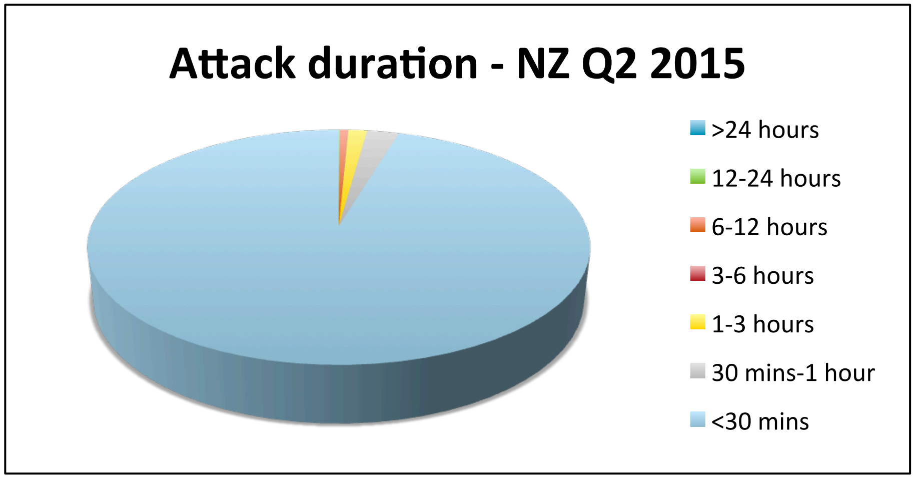


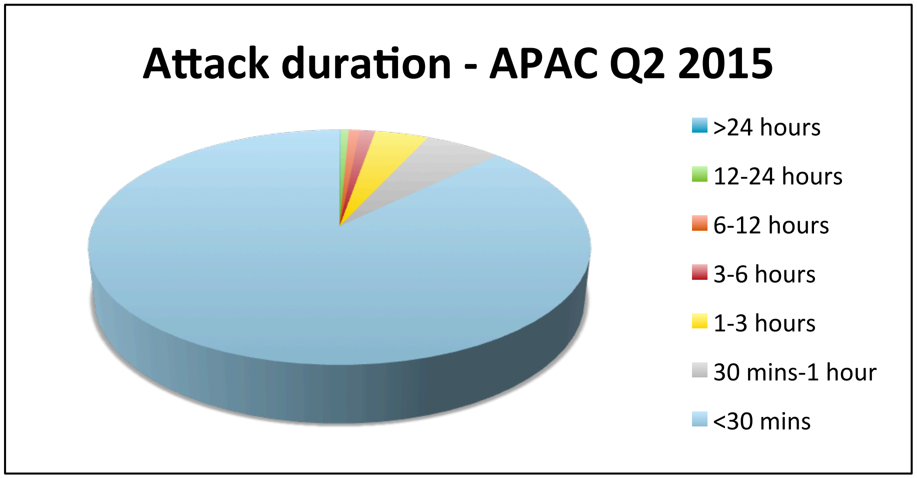


2015 ATLAS : Attacks Durations in NZ

Duration Break-Out (Q2 2015)

	NZ Average	APAC Average
Average duration	15 min 39 sec	39 min 53 sec
> 12 hours	< 0.1%	1%
< 1 hour	97%	93%





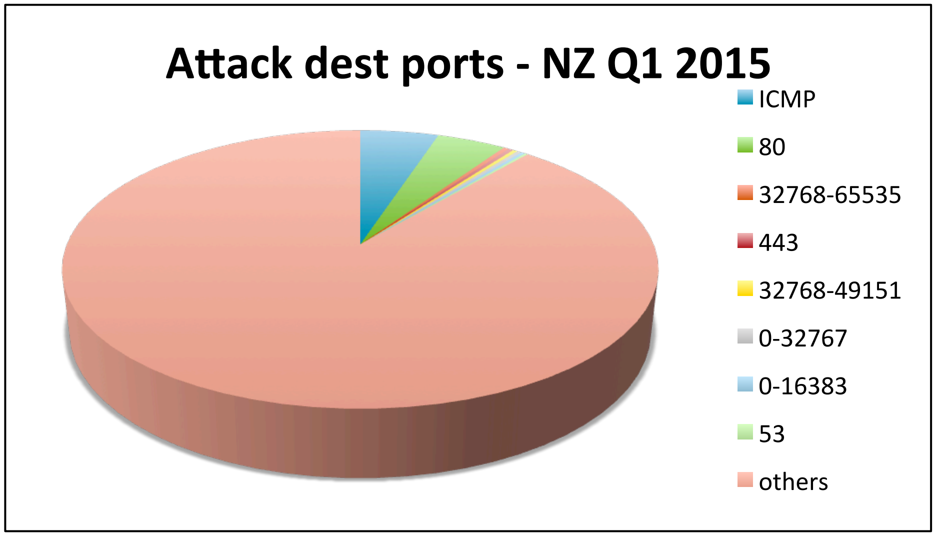
2015 ATLAS : Attack Destination Ports/Protos NZ

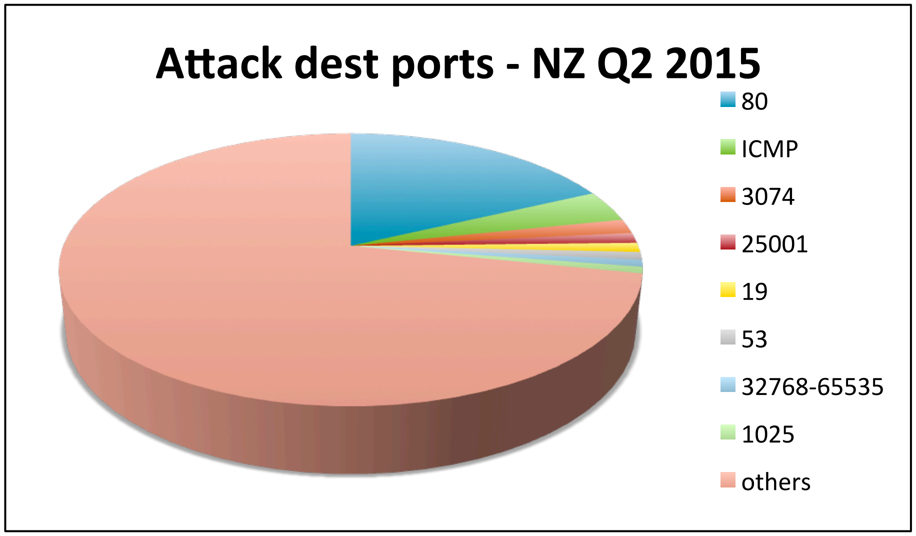
Dest Port Breakdown, Q1 2015

- ICMP PING at number 1, with 5% of events.
- UDP/80 at number 2, with 4% of events
- Random ports at number 3, with ~1% of events

Dest Port Breakdown, Q2 2015

- UDP/80 number 1, with 18% of events.
- ICMP PiNG at number 2, with 4% of events
- UDP/3074 at number 3, with 2%

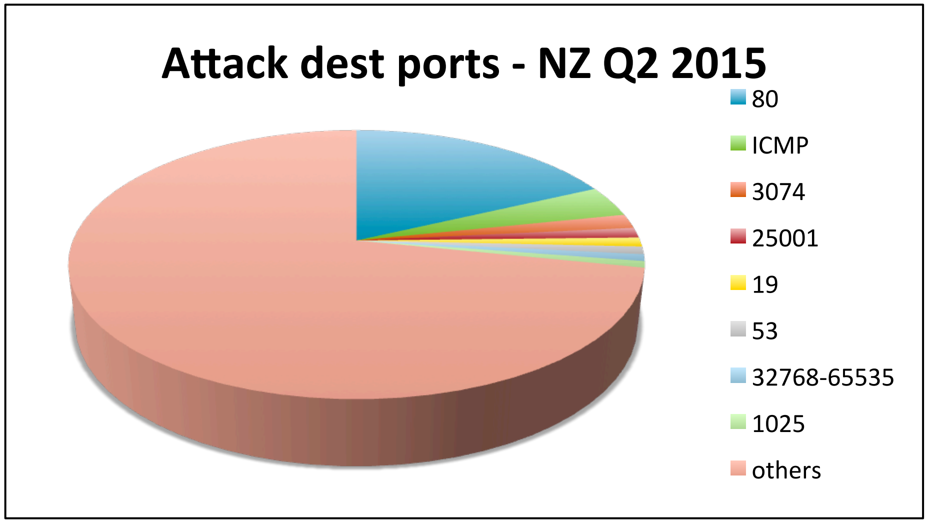


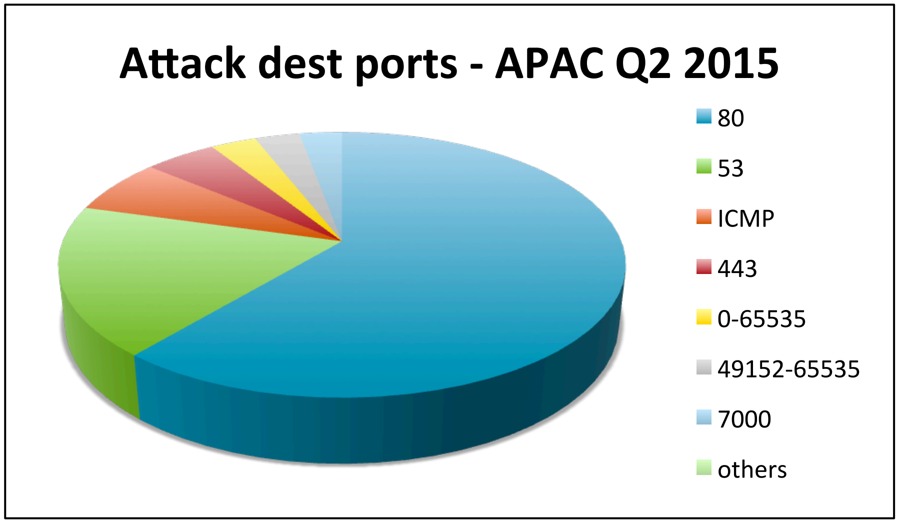


2015 ATLAS : Attack Destination Ports/Protos NZ

Dest Port Breakdown (Q2 2015)

	NZ	APAC
Top #1	UDP/80 (18%)	UDP/80 (61%)
Top #2	ICMP PING (4%)	UDP/53 (18%)
Top #3	UDP/3074 (2%)	ICMP PING (7%)





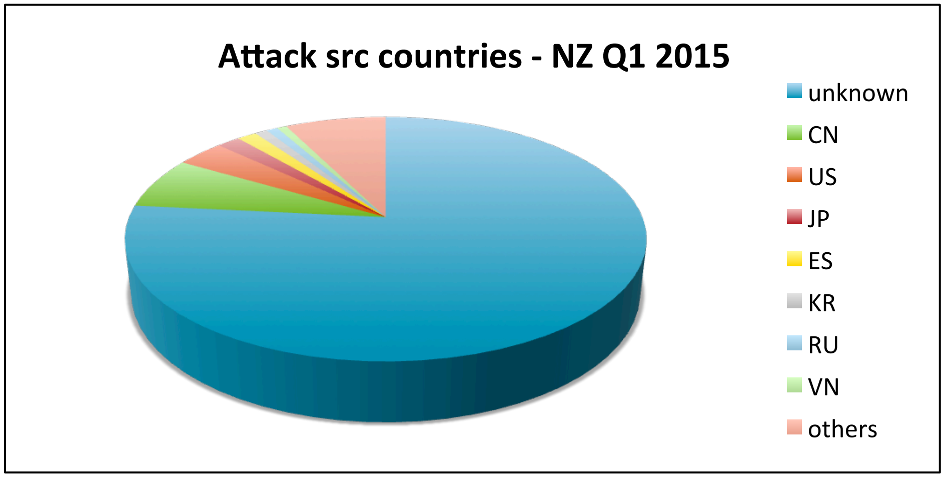
2015 ATLAS : Attack Source Countries NZ

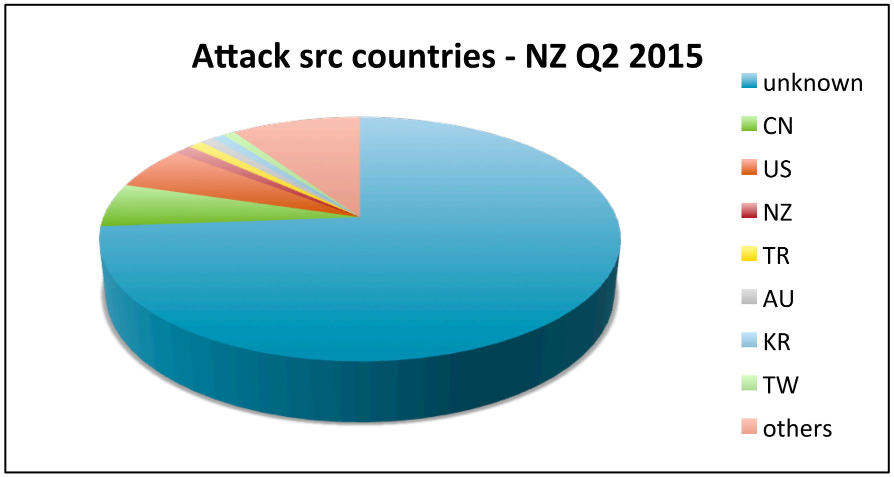
Source Breakdown, Q1 2015

- 77% of monitored events cannot be attributed due to data anonymisation / distribution
- Of the remaining 23%, the top 3 sources are:
  - CN : 7%
  - US : 4%
  - JP : 2%

Source Breakdown, Q2 2015

- 74% of monitored events cannot be attributed due to data anonymisation / distribution
- Of the remaining 26%, the top 3 sources are:
  - CN : 6%
  - US : 6%
  - NZ : 1%

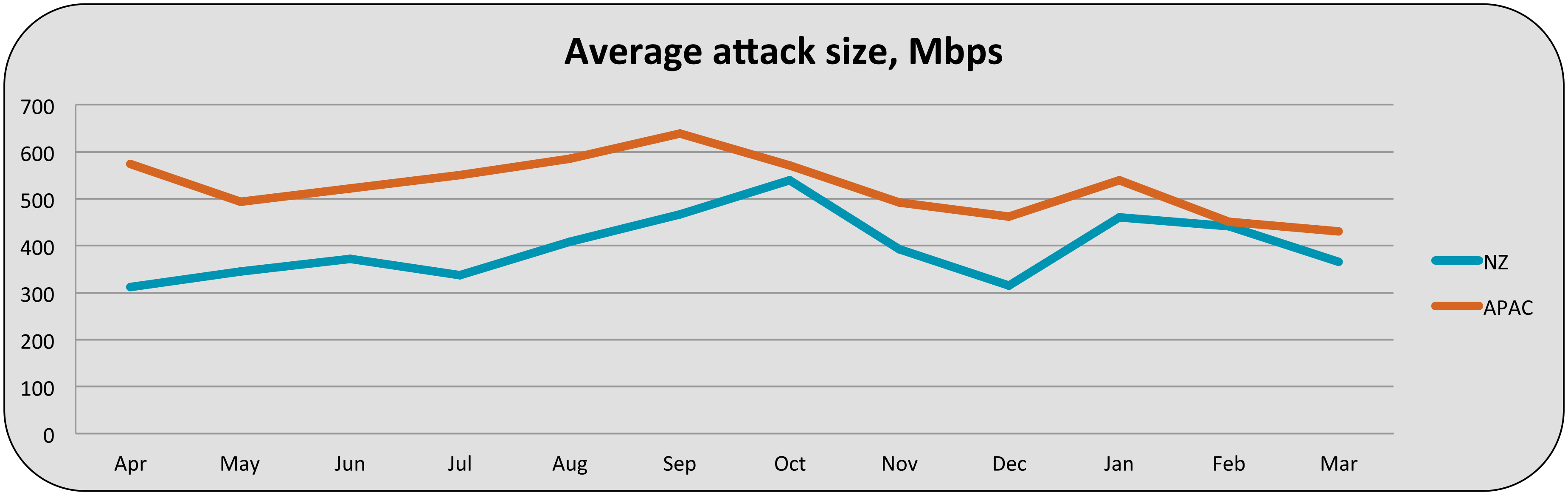




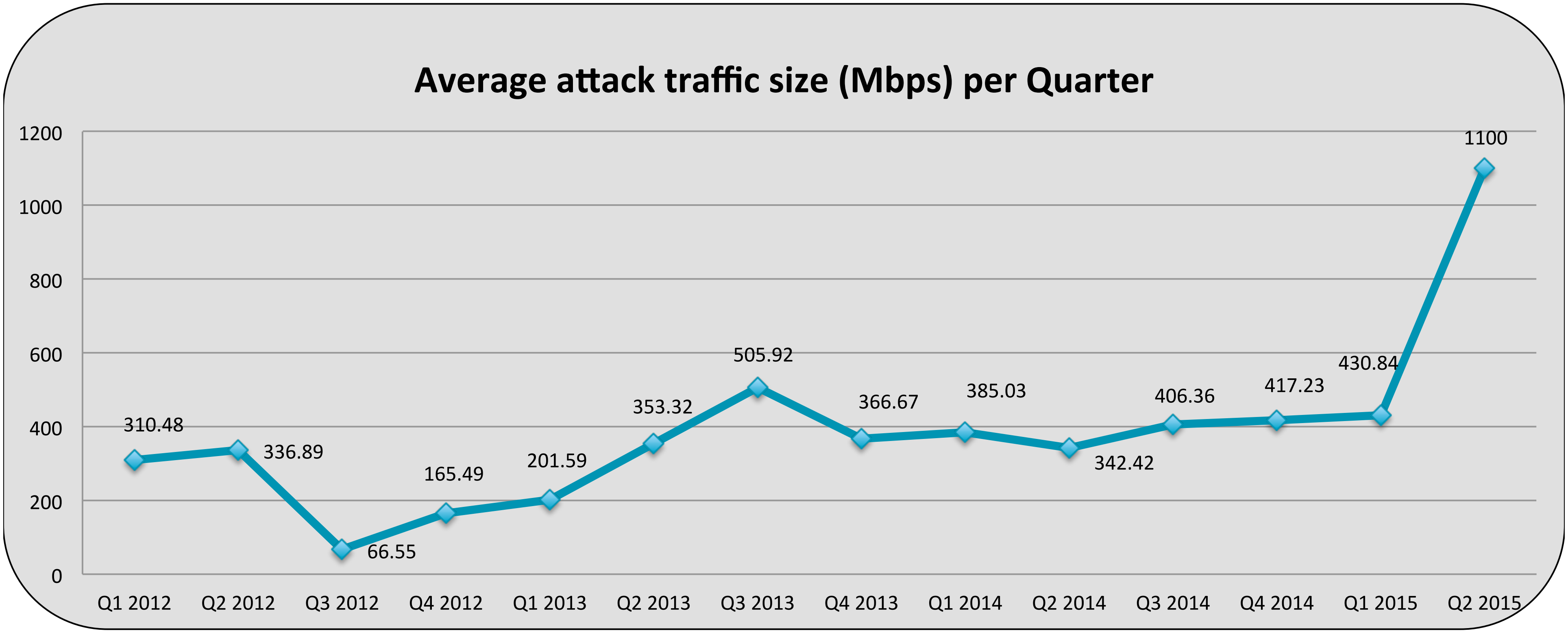
2015 ATLAS : Average Attack Size NZ

Average Attack Sizes, Month-by-Month

- APAC average attack size is between 550mb/sec – 650mb/sec
- NZ average attack size is smaller than the APAC average



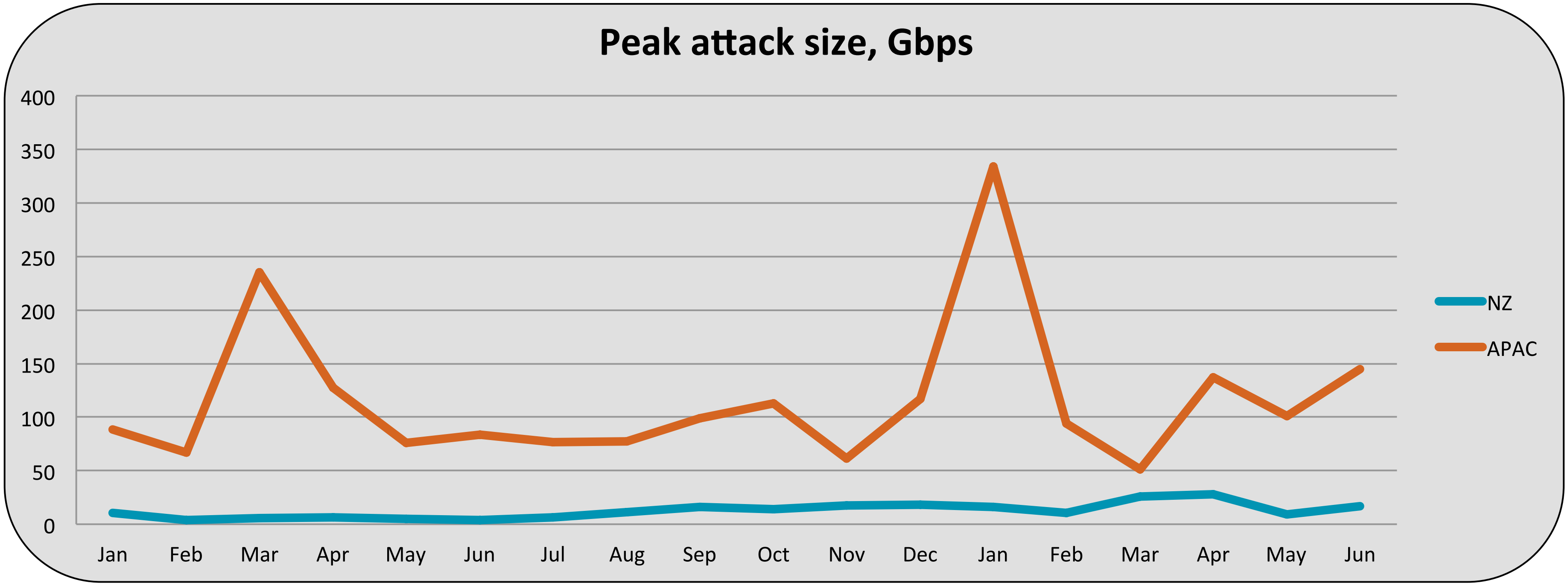
ATLAS : Average Attack Size NZ



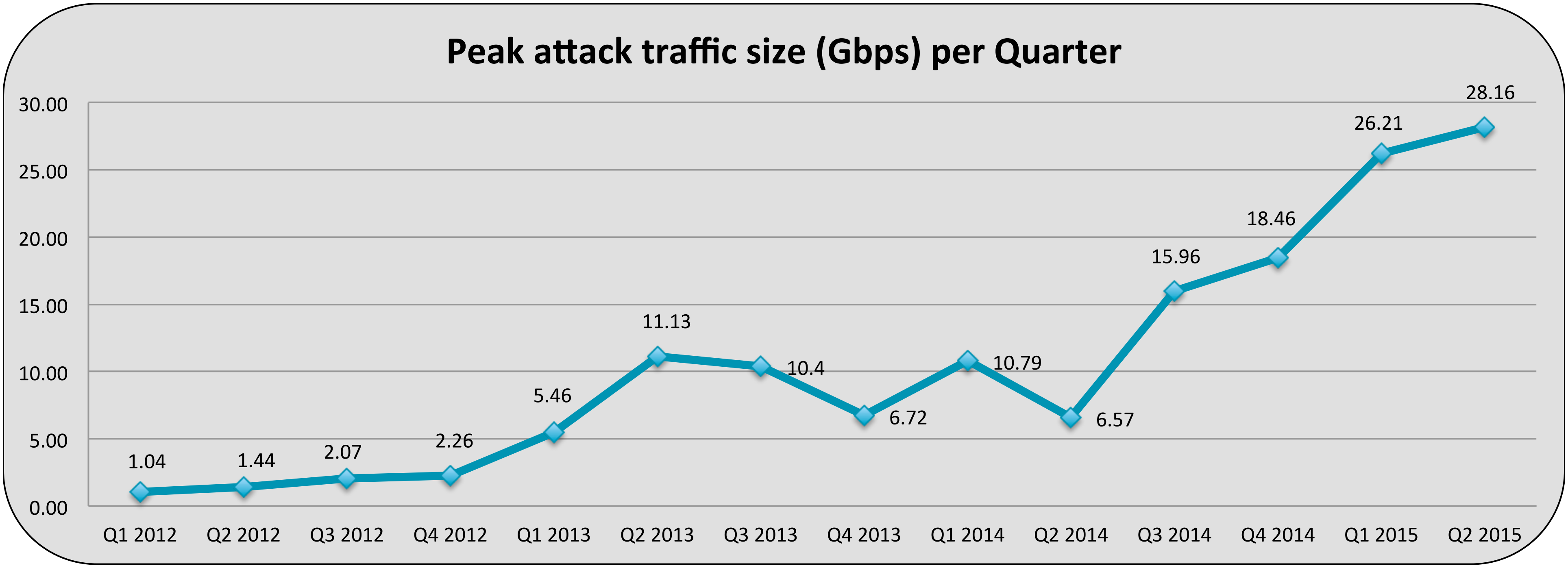
2015 ATLAS : Peak Attack Size NZ

Peak Attack Sizes, Month-by-Month

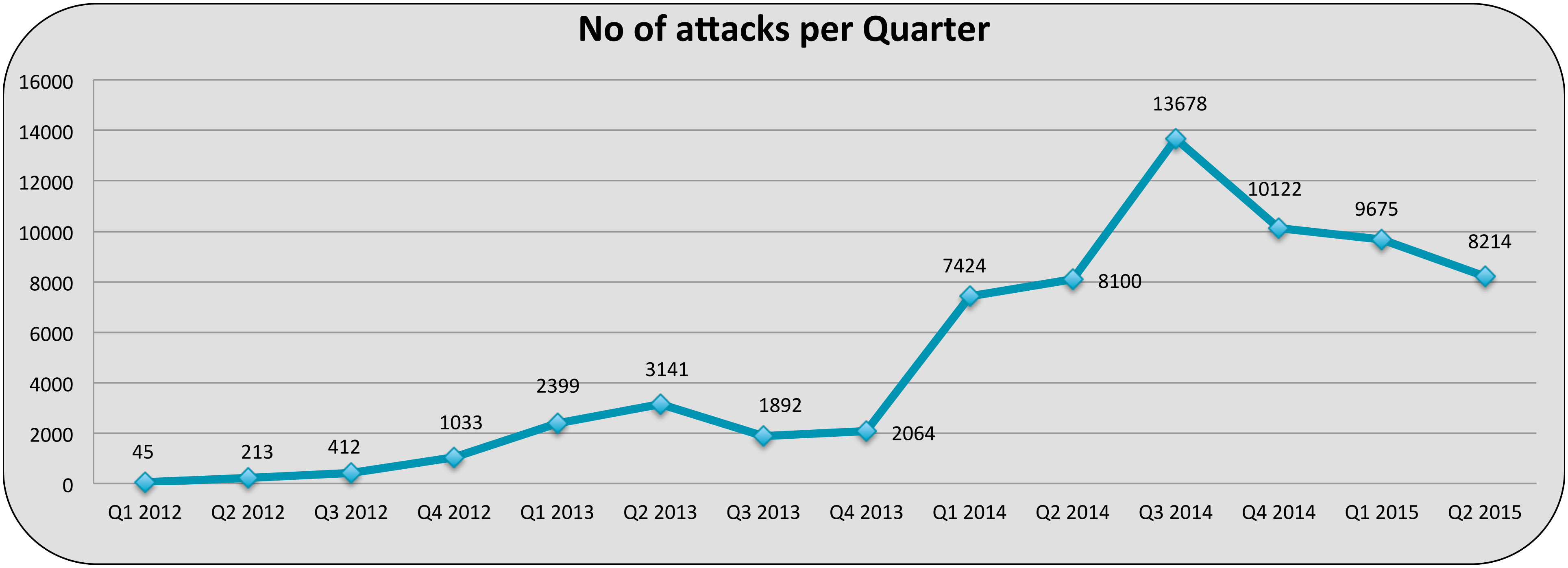
- Peak attack sizes in NZ are much lower than the APAC peak
- NZ peak attack sizes usually < 10 Gbps



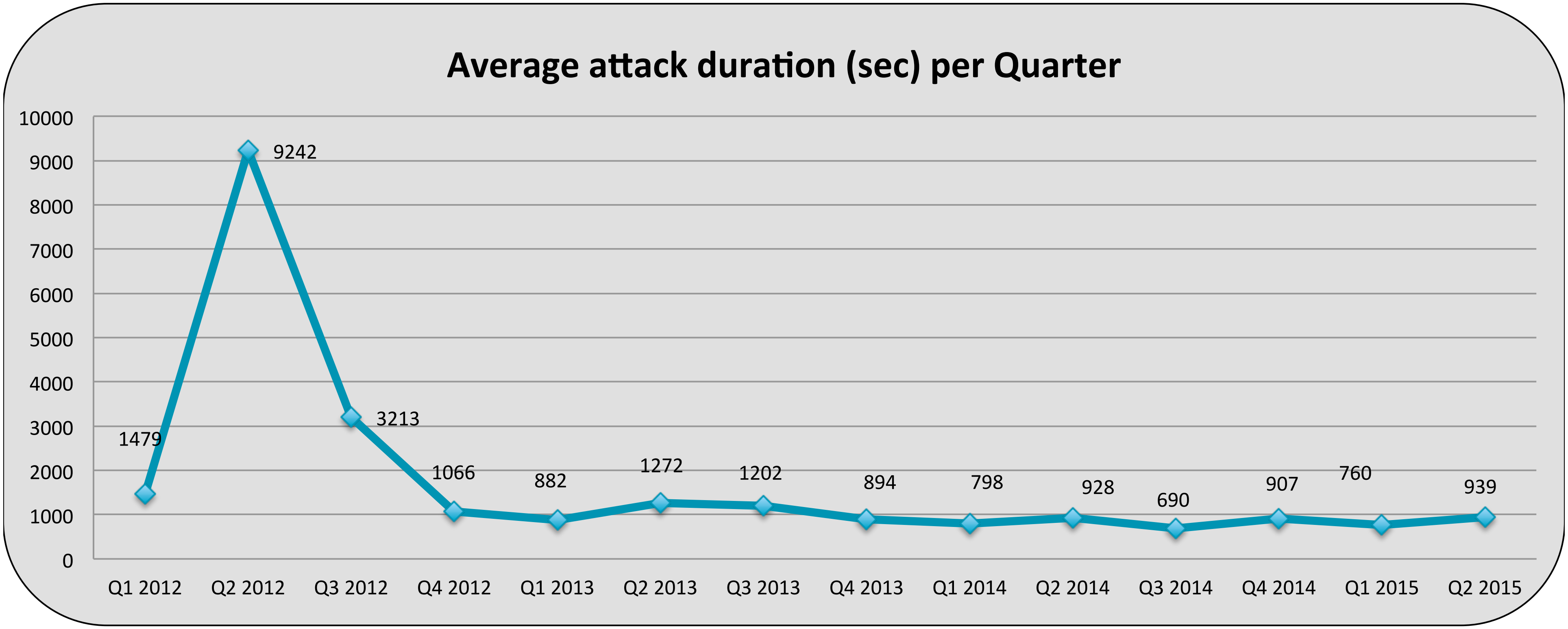
ATLAS : Peak Attack Sizes NZ



ATLAS : Number of Attacks in NZ



ATLAS : Average Attack Duration NZ



This Presentation – http://bit.ly/1F0Nfrc

ARBOR® NETWORKS

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Thank You!

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