The Internet DDoS Threat Landscape

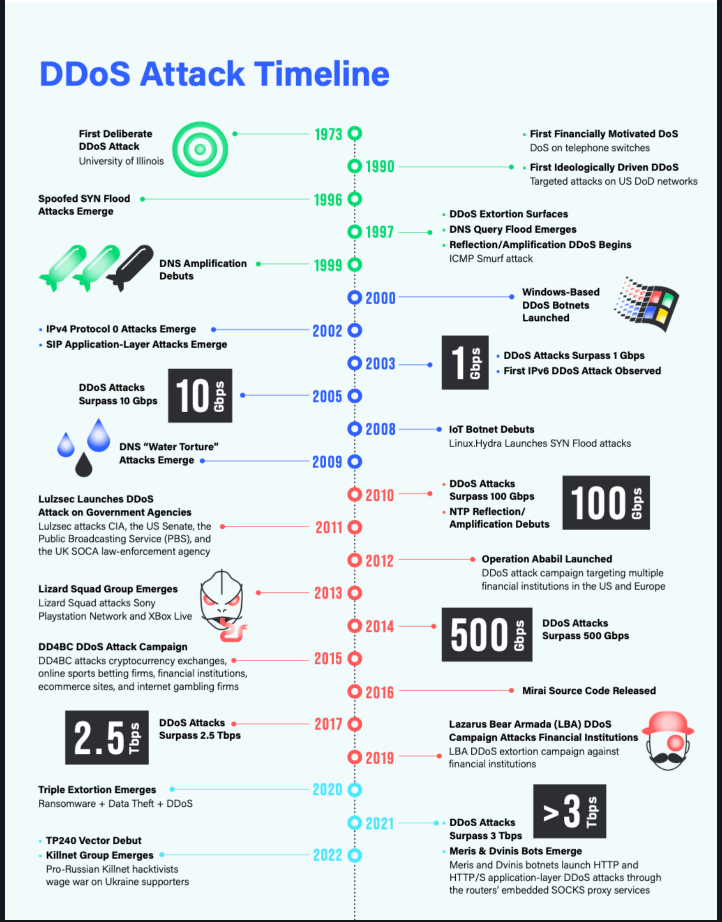
Global and Regional Update 2023-06-06

John Kristoff, Principal Analyst, NETSCOUT ASERT

A Brief Segue:
DDoS Attack History

Early DDoS Attack Timeline Highlights

- 1973: First DDoS attack
- 1996: Spoofed TCP SYN attacks
- 1997: Reflection/amplification ICMP floods
- 1999: DNS amplification/reflection debuts
- 2000: Windows botnets debut
- 2003: Slammer worm, IPv6 DDoS
- 2005: Attacks surpass 10 Gbps
- 2008: IoT botnet Linux-based Hydra



DDoS Attack Timeline

1973 – **First Deliberate DDoS Attack**
University of Illinois

- **First Financially Motivated DoS**
  DoS on telephone switches

1990 – **First Ideologically Driven DDoS**
Targeted attacks on US DoD networks

1996 – **Spoofed SYN Flood Attacks Emerge**

1997
- **DDoS Extortion Surfaces**
- **DNS Query Flood Emerges**
- **Reflection/Amplification DDoS Begins**
  ICMP Smurf attack

1999 – **DNS Amplification Debuts**

2000 – **Windows-Based DDoS Botnets Launched**

2002
- **IPv4 Protocol 0 Attacks Emerge**
- **SIP Application-Layer Attacks Emerge**

2003 – 1 Gbps
- **DDoS Attacks Surpass 1 Gbps**
- **First IPv6 DDoS Attack Observed**

2005 – **DDoS Attacks Surpass 10 Gbps** – 10 Gbps

2008 – **IoT Botnet Debuts**
Linux.Hydra Launches SYN Flood attacks

2009 – **DNS "Water Torture" Attacks Emerge**

2010 – 100 Gbps
- **DDoS Attacks Surpass 100 Gbps**
- **NTP Reflection/ Amplification Debuts**

2011 – **Lulzsec Launches DDoS Attack on Government Agencies**
Lulzsec attacks CIA, the US Senate, the Public Broadcasting Service (PBS), and the UK SOCA law-enforcement agency

2012 – **Operation Ababil Launched**
DDoS attack campaign targeting multiple financial institutions in the US and Europe

2013 – **Lizard Squad Group Emerges**
Lizard Squad attacks Sony Playstation Network and XBox Live

2014 – 500 Gbps – **DDoS Attacks Surpass 500 Gbps**

2015 – **DD4BC DDoS Attack Campaign**
DD4BC attacks cryptocurrency exchanges, online sports betting firms, financial institutions, ecommerce sites, and internet gambling firms

2016 – **Mirai Source Code Released**

2017 – 2.5 Tbps – **DDoS Attacks Surpass 2.5 Tbps**

2019 – **Lazarus Bear Armada (LBA) DDoS Campaign Attacks Financial Institutions**
LBA DDoS extortion campaign against financial institutions

2020 – **Triple Extortion Emerges**
Ransomware + Data Theft + DDoS

2021 – >3 Tbps
- **DDoS Attacks Surpass 3 Tbps**
- **Meris & Dvinis Bots Emerge**
  Meris and Dvinis botnets launch HTTP and HTTP/S application-layer DDoS attacks through the routers' embedded SOCKS proxy services

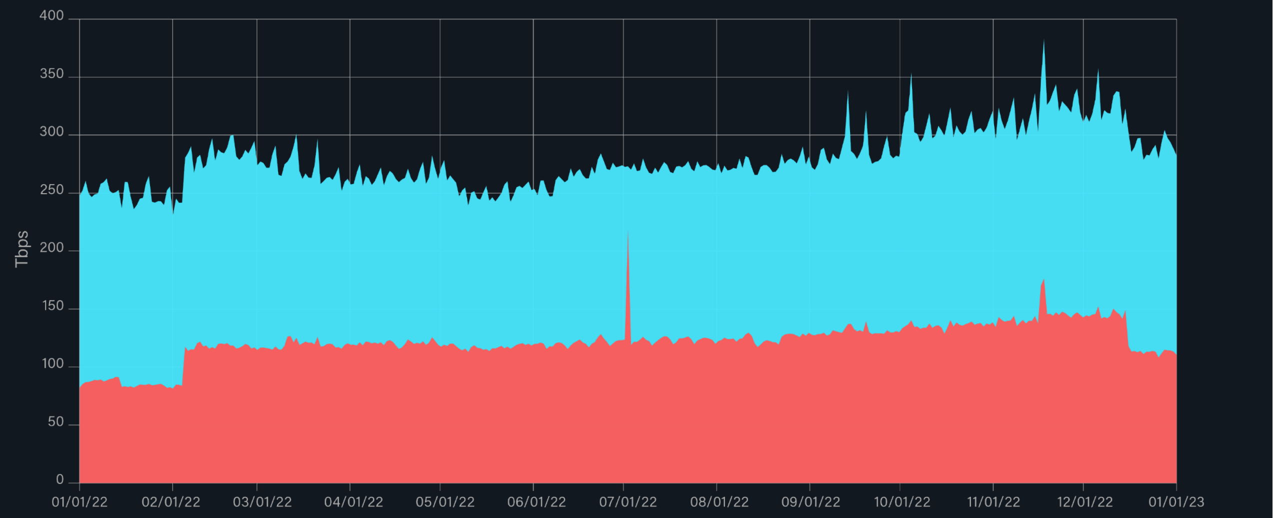
2022
- **TP240 Vector Debut**
- **Killnet Group Emerges**
  Pro-Russian Killnet hacktivists wage war on Ukraine supporters

Internet Traffic Capacity: To Infinity and Beyond

Measurement Platform Overview

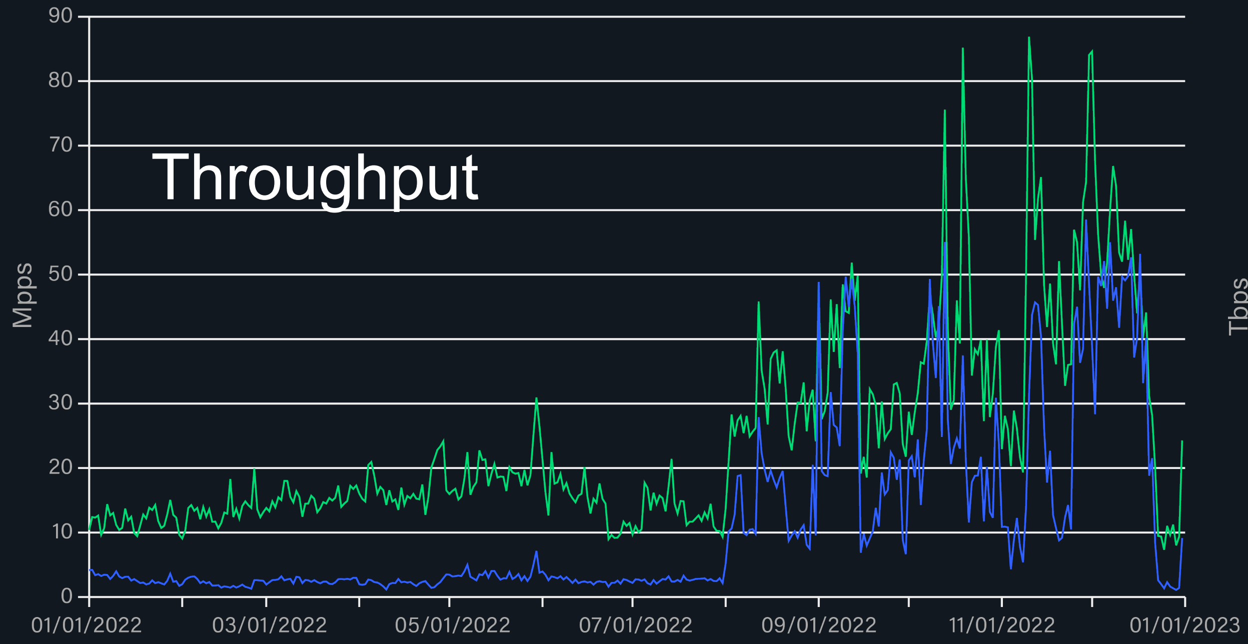
- 500+ of the world’s largest networks
- Exposed to 400+ Tb/s daily traffic
- ~ 93 countries, ~ ½ of the world
- 807% ⬆️ attack frequency since 2013

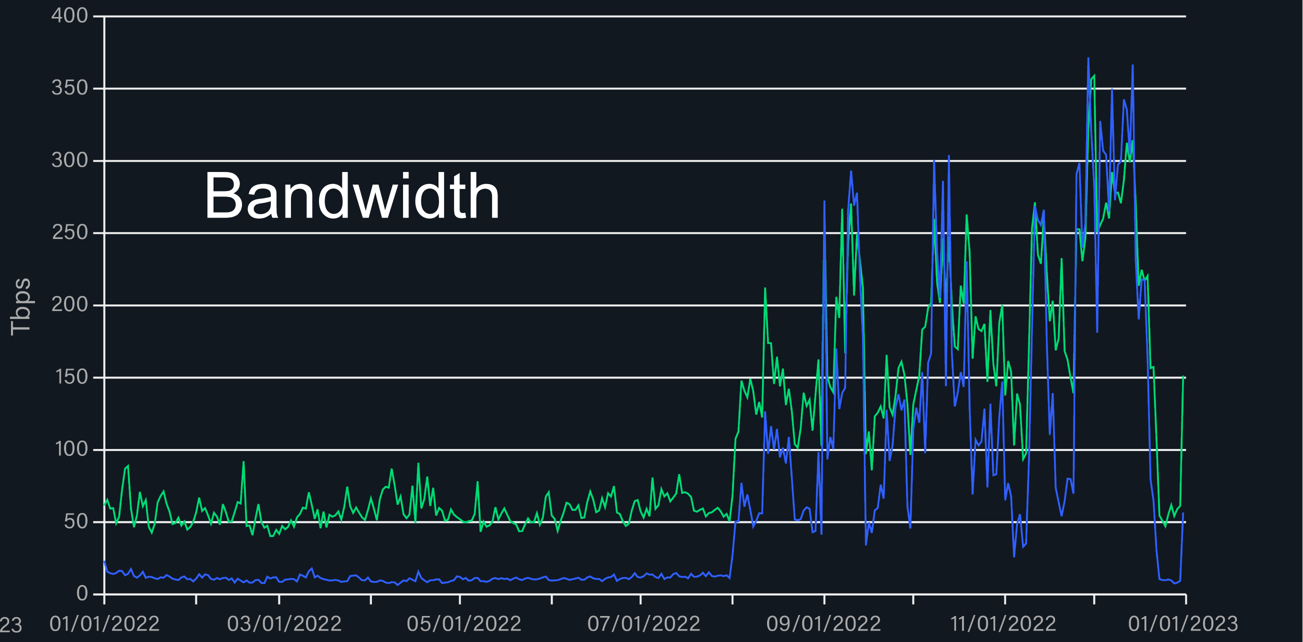
What 400 Tb/s looks like



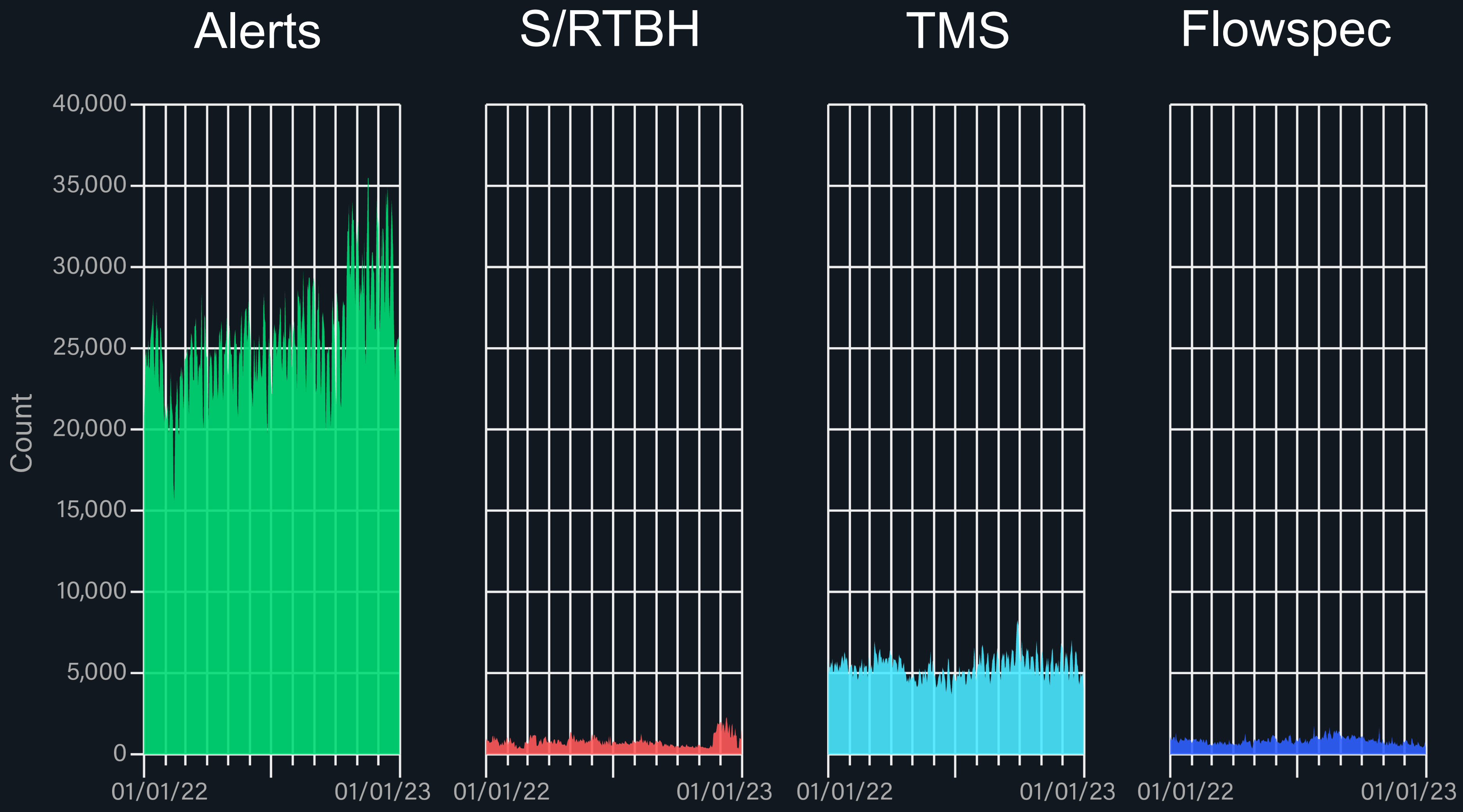
Alerts vs. Mitigation at ISPs

- 25% of alerts lead to counter measures
- ISPs scrub medium+high severity alerts
- But pass lower alerts to balance cost, availability, and scale



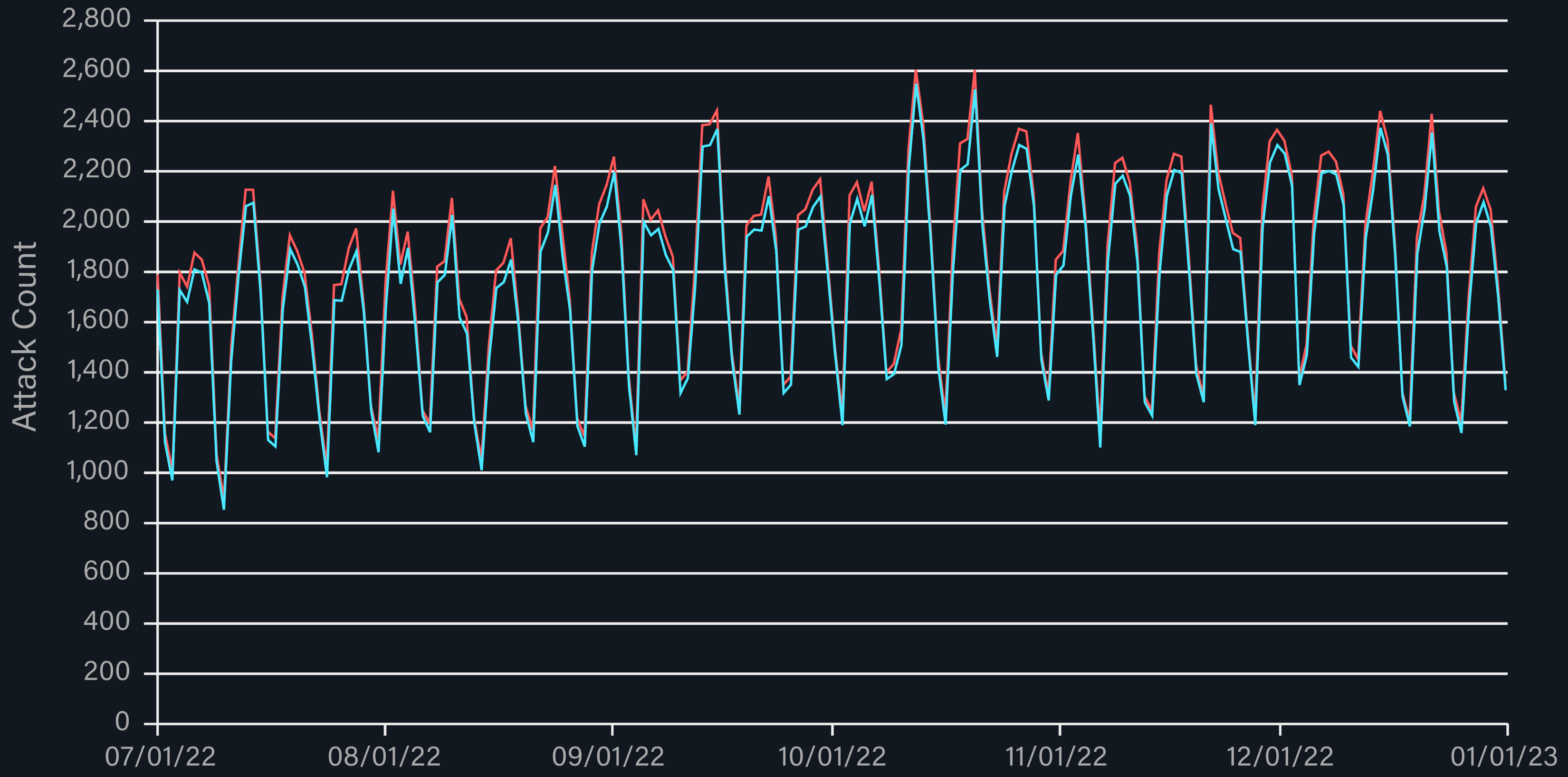


ISP Mitigation Breakdown



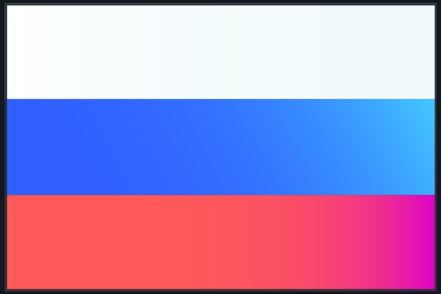
Alerts vs. Mitigation in the Enterprise

- Nearly 100% of alerts result in active countermeasures



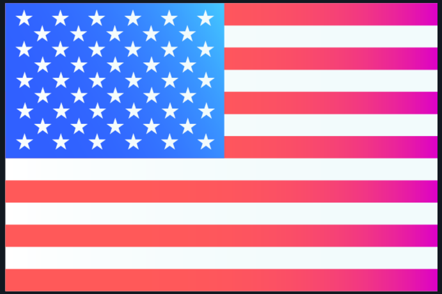
Enterprise Mitigation Breakdown

- More than 40 different countermeasures used
- 1/3 of Enterprise customers leverage geo-loc (IP address) blocking
- Many block 70+ countries in a counter measure (top 5 blocked countries below)

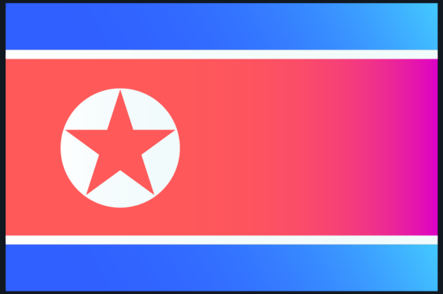


Russia

China



United States



North Korea

Afghanistan

Bad Bots on the Net

Botnet Attacks Against ISPs

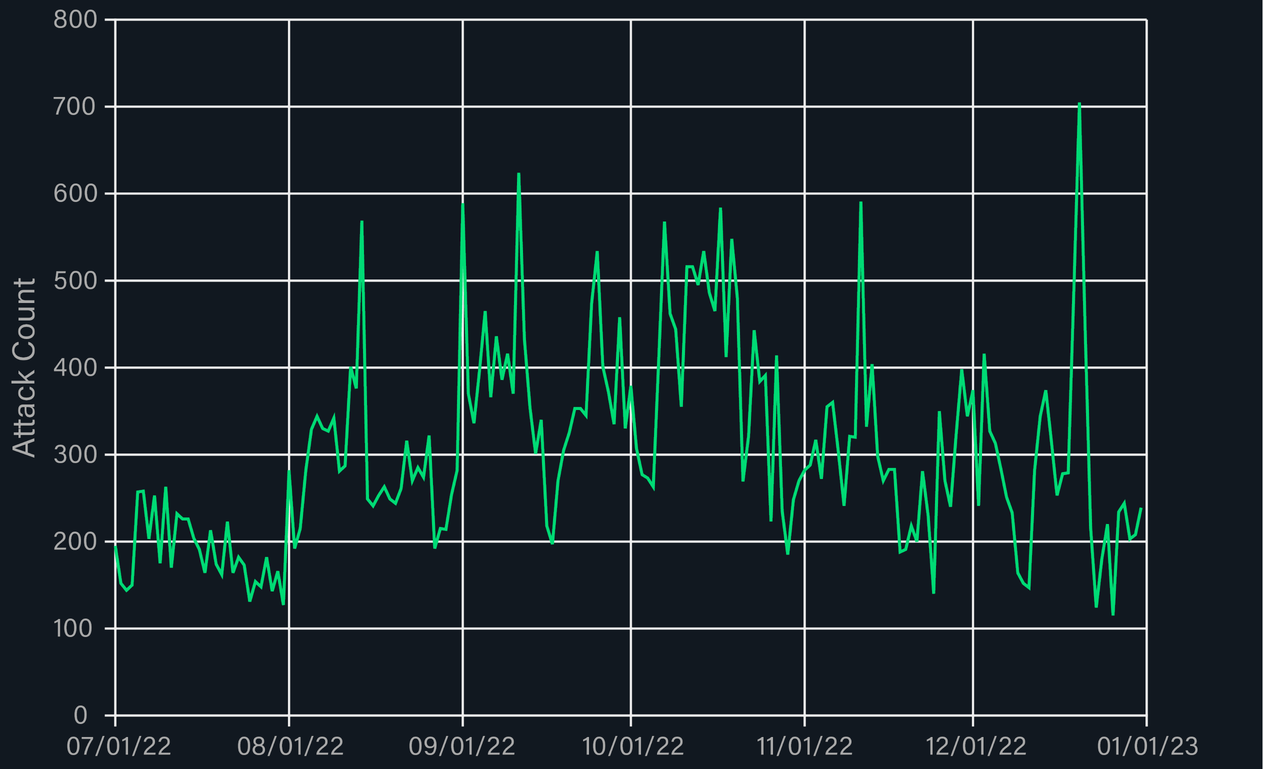
~60,000 botnet alerts in 2022-2H

Top Sources

- United States
- China
- South Korea

Top Targets

- South Korea
- United States
- Italy



Botnet Attacks Against Enterprises

~350,000 botnet alerts in 2022-2H

Top Sources

🇨🇳 China

🇮🇳 India

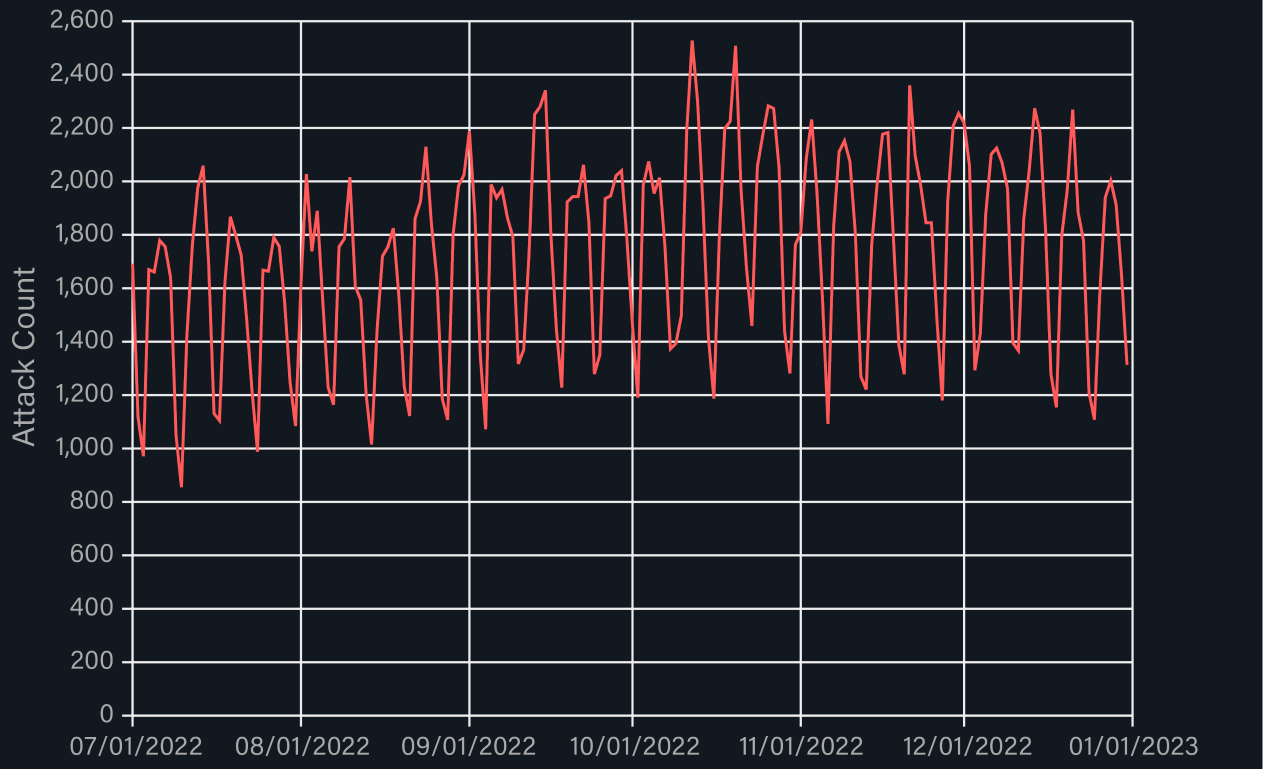
🇺🇸 United States

Top Targets

🇺🇸 United States

🇲🇽 Mexico

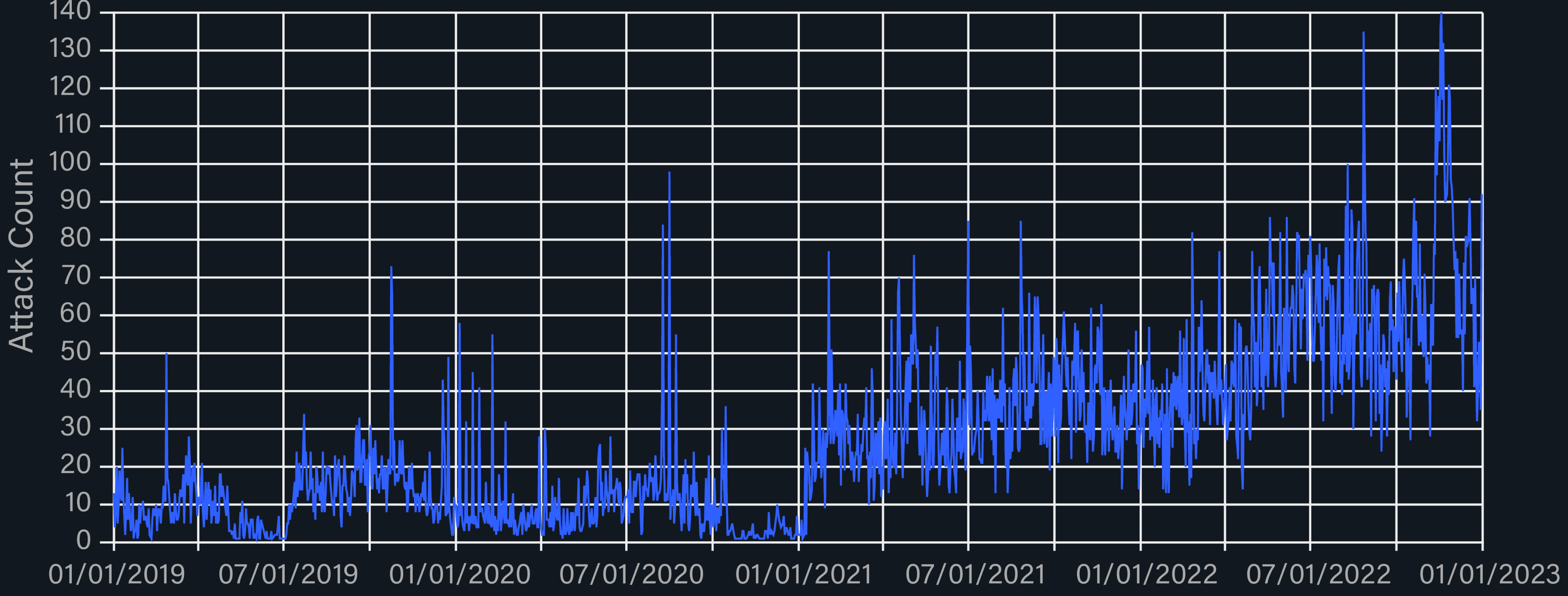
🇪🇸 Spain



Rising Tides:
Changes in Methodology

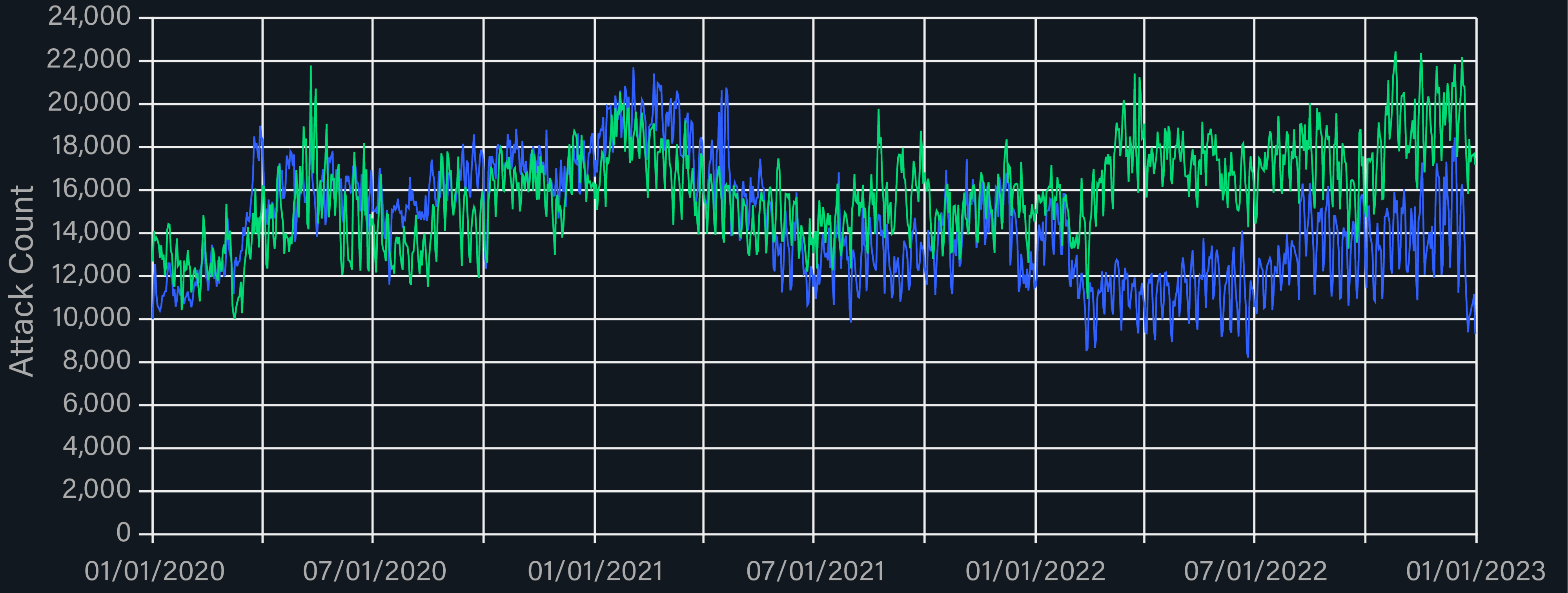
HTTP/HTTPS Application Layer Attacks

487% increase since 2019



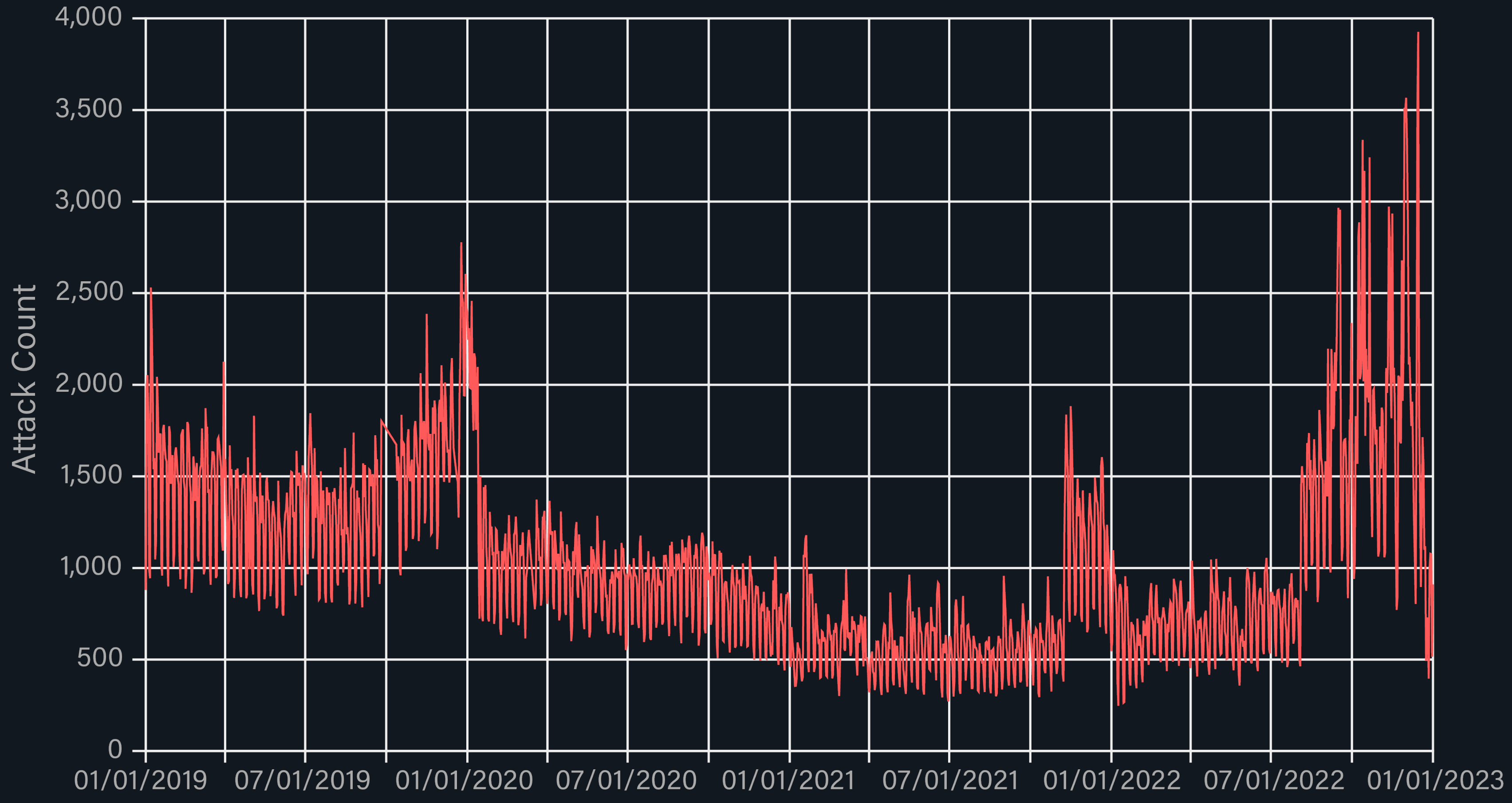
Direct-path vs. Reflection/amplification

- Direct-path
  18% +
- Reflection / amplification
  18% -



Carpet-Bombing DDoS Attacks

110% increase in 2022-2H

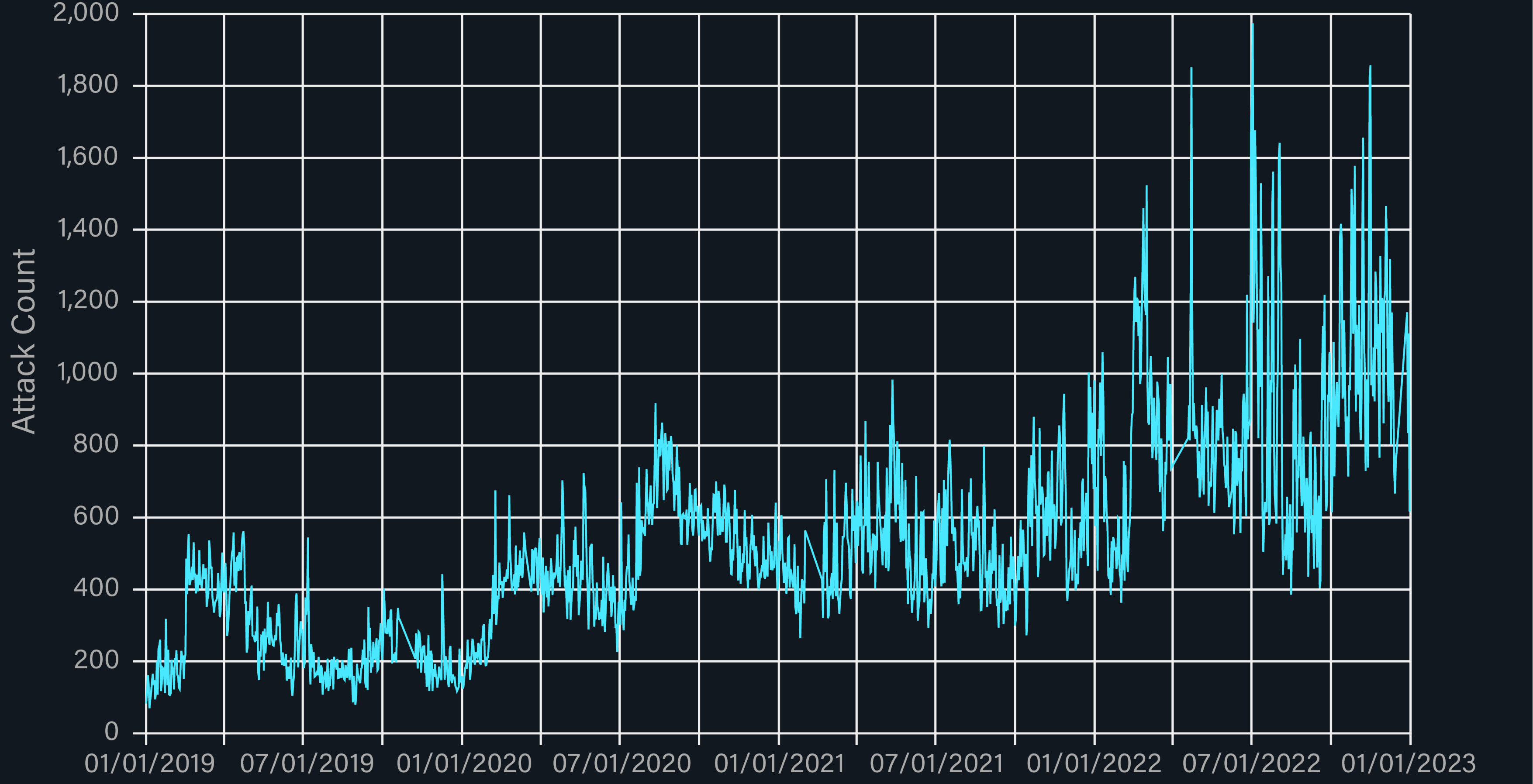


DNS Query Flood (Water-Torture) Attacks

243% total increase since 2019

By region:

APAC	108%
EMEA	131%
LATAM	15%
NAMER	41%



Adaptive DDoS: Attack Agility

Dissecting an Adaptive DDoS Attack

Costa Rican energy organization

- DDoS attacks can last from mere seconds to months and even years.
- Over the course of 7 days, this DDoS attack showed significant variance.

HOUR 1

18 Gbps

3 Attack Vectors

DAY 2-4

39-190 Gbps

9 Attack Vectors

DAY 5-7

195 Gbps

DDoS Attack Motivations Know No Bounds

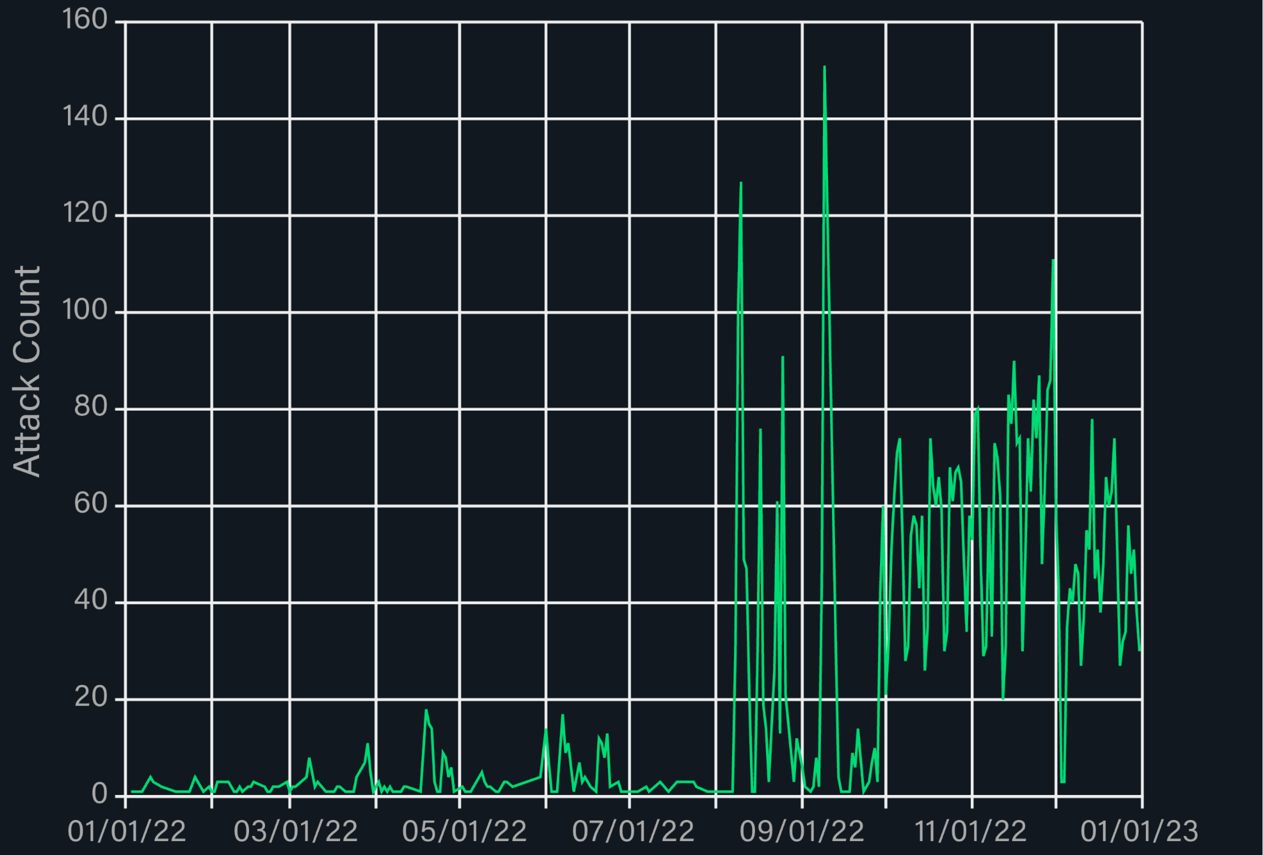
Optical Instruments and Lens Manufacturing

in EMEA

- 14,137% ⬆️ attacks in 2022-2H
- 6,000+ attacks in about four months
- Peaks of 260 Gb/s and 42 Mp/s
- No discernible reason for the attacks

b/s = gigabits per second

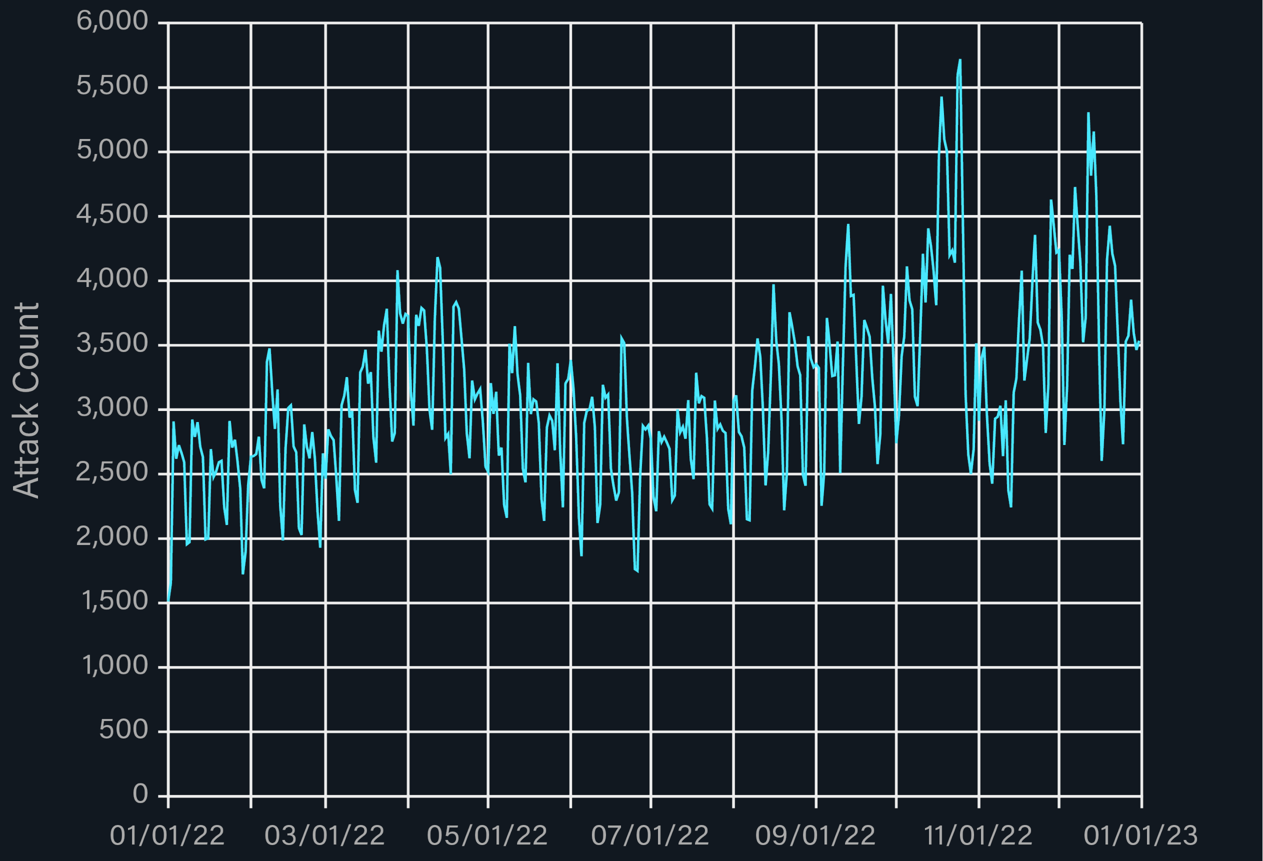
p/s = packets per second



Wireless Telecommunications

Global

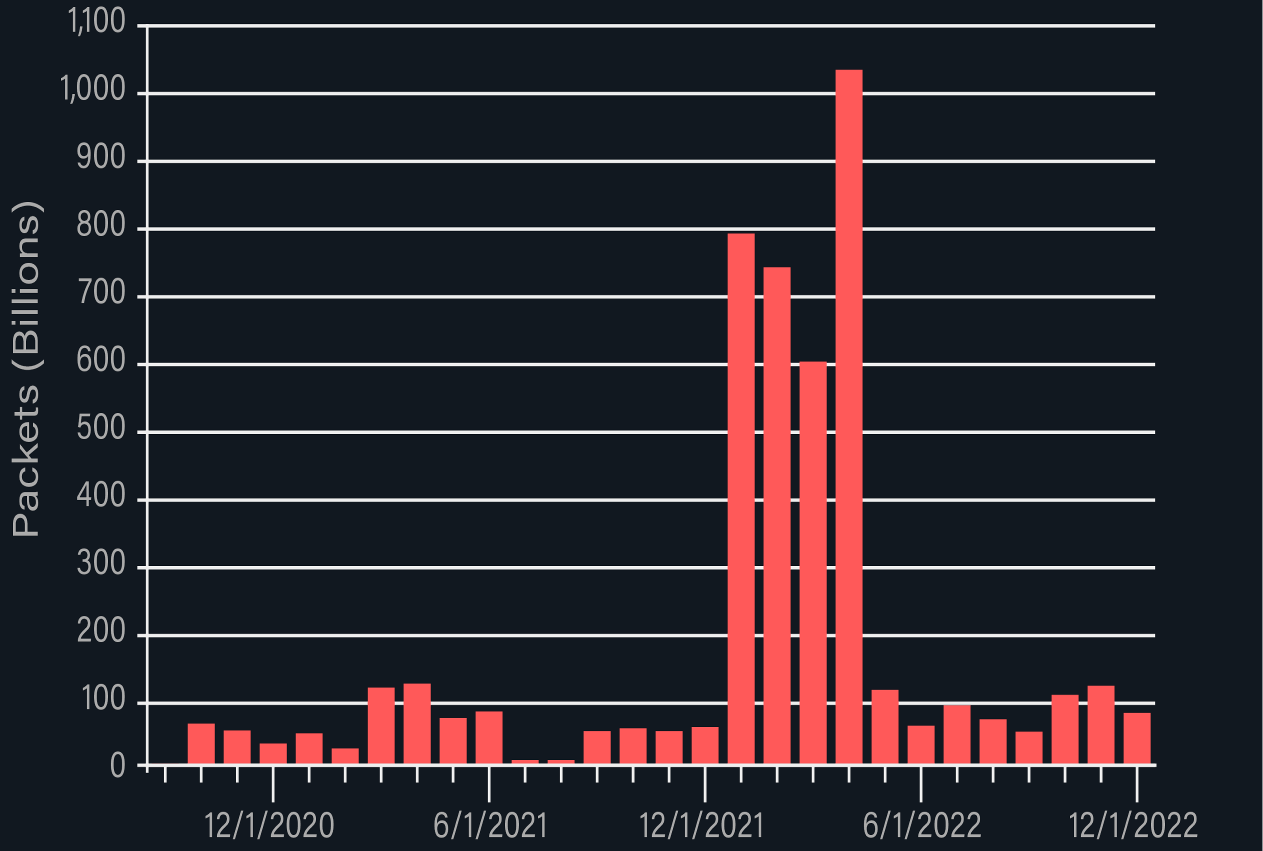
- 79% increase in attacks since 2020
- Accounts for 20% of all global attacks
- Coincides with growth of 5G Wireless
- Motivation?: Attacks almost certainly disproportionate to gaming and general availability of more wireless connected IoT devices.



Manufacturing

Global

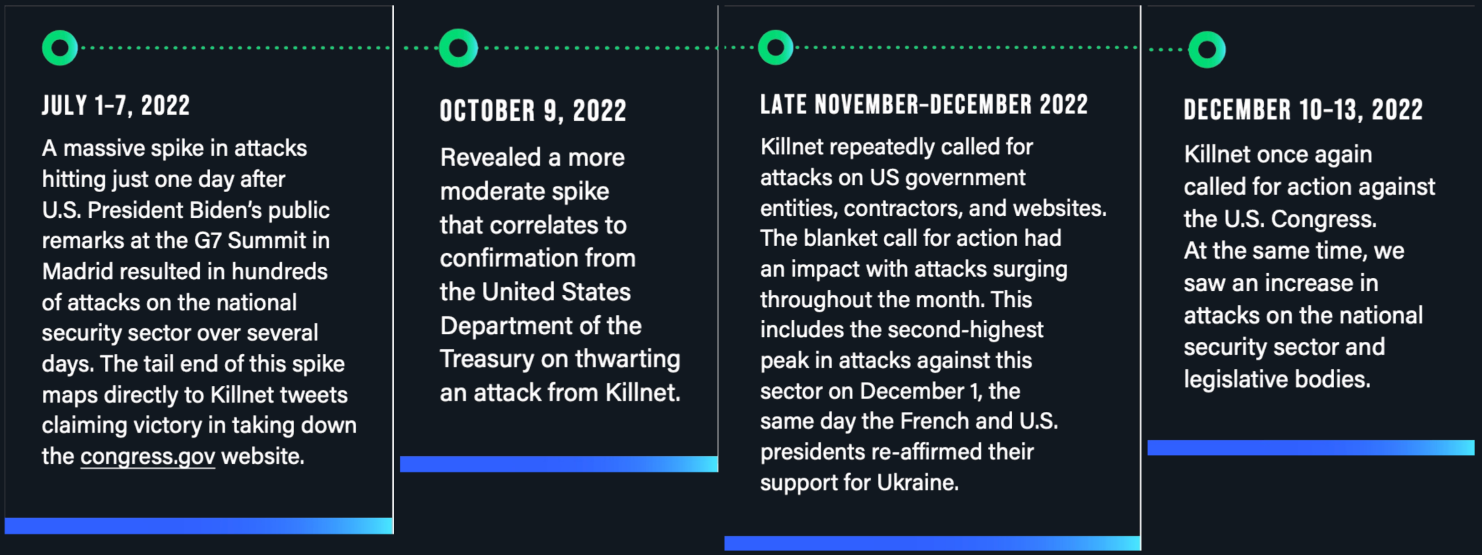
- Sustained attacks over four months
- 950+ billion malformed packets/day
- Predominantly app-layer attacks
- Coincides with ransomware event halting manufacturer operations
- Motivation?: Financial gain



Government and National Security

Global

- Attack spikes directly aligned with pro-Russian Killnet operations.



JULY 1-7, 2022

A massive spike in attacks hitting just one day after U.S. President Biden's public remarks at the G7 Summit in Madrid resulted in hundreds of attacks on the national security sector over several days. The tail end of this spike maps directly to Killnet tweets claiming victory in taking down the congress.gov website.

OCTOBER 9, 2022

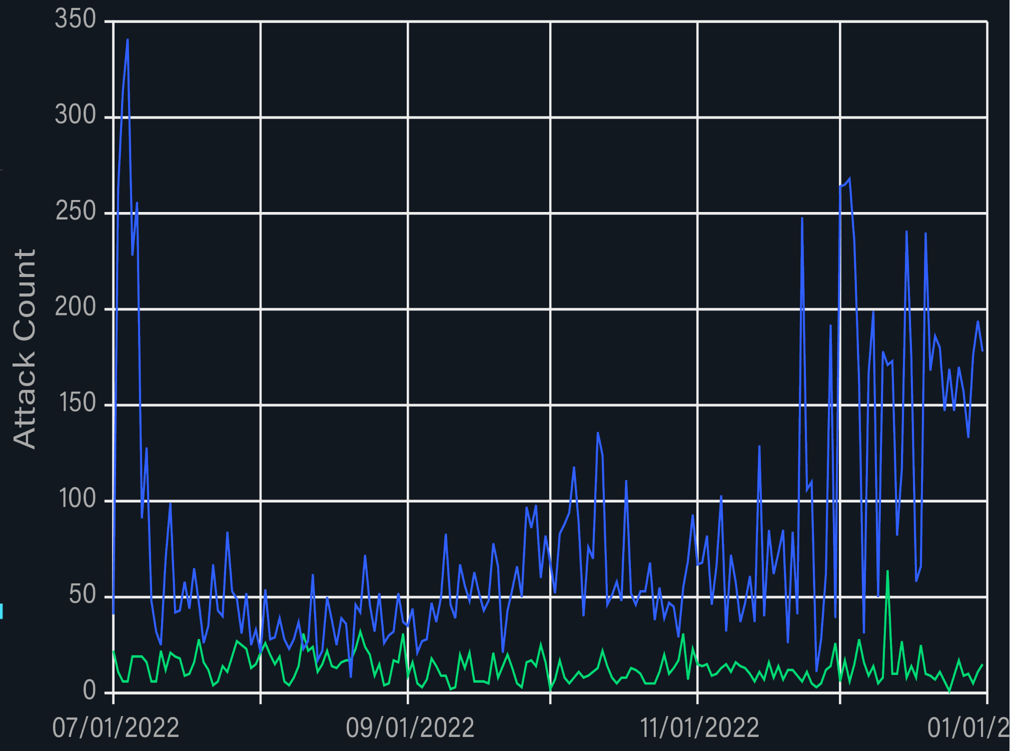
Revealed a more moderate spike that correlates to confirmation from the United States Department of the Treasury on thwarting an attack from Killnet.

LATE NOVEMBER-DECEMBER 2022

Killnet repeatedly called for attacks on US government entities, contractors, and websites. The blanket call for action had an impact with attacks surging throughout the month. This includes the second-highest peak in attacks against this sector on December 1, the same day the French and U.S. presidents re-affirmed their support for Ukraine.

DECEMBER 10-13, 2022

Killnet once again called for action against the U.S. Congress. At the same time, we saw an increase in attacks on the national security sector and legislative bodies.

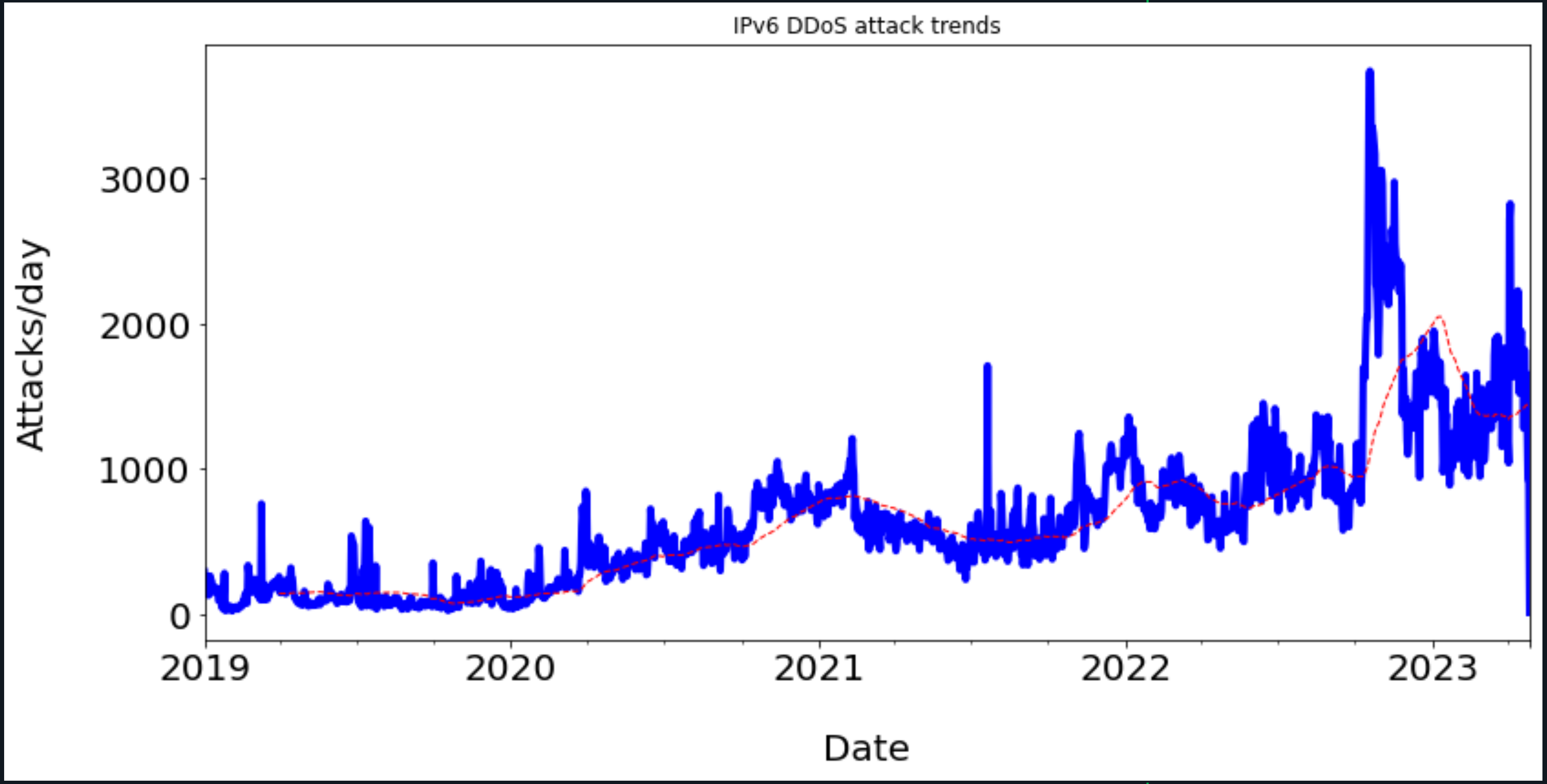


- <span>Motivation?:</span> Geopolitical hacktivism

Keeping Our Eyes Open

IPv6 Attacks

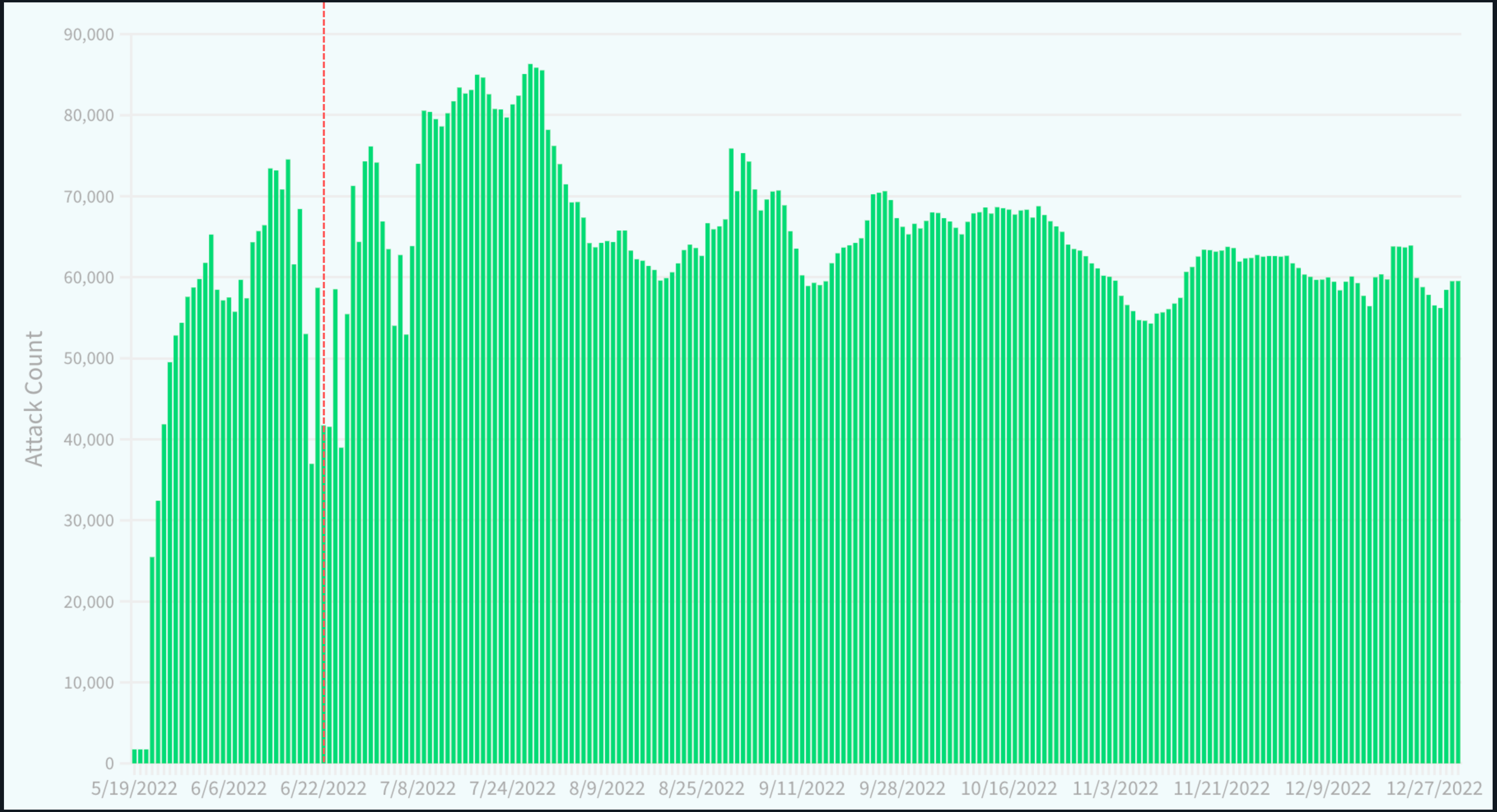
We’re seeing activity, but with a caveat



Take Down and Take Action

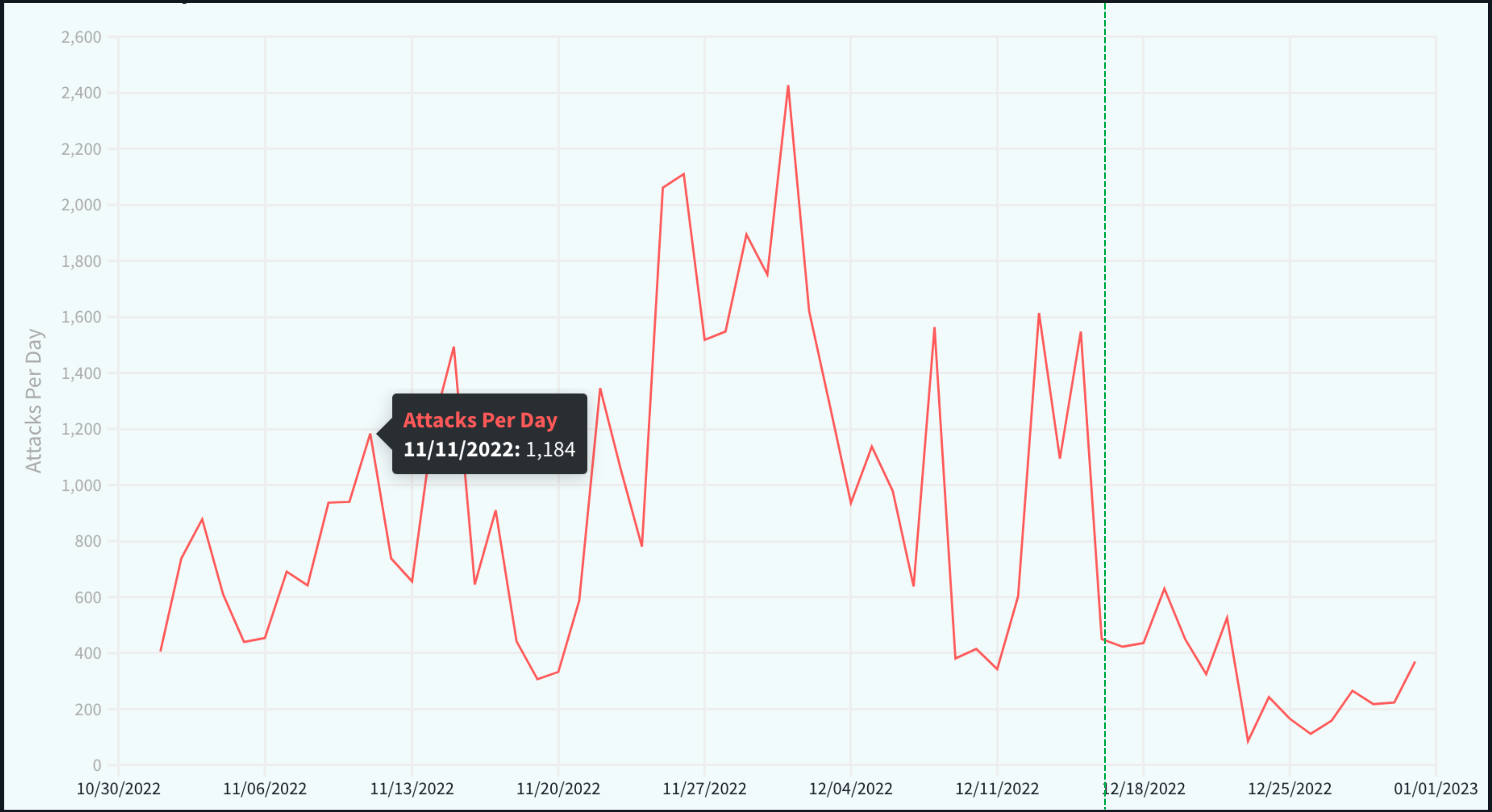
Botnet Takedown

June 2022 – Moderate Effect



DDoS-for-Hire Takedown

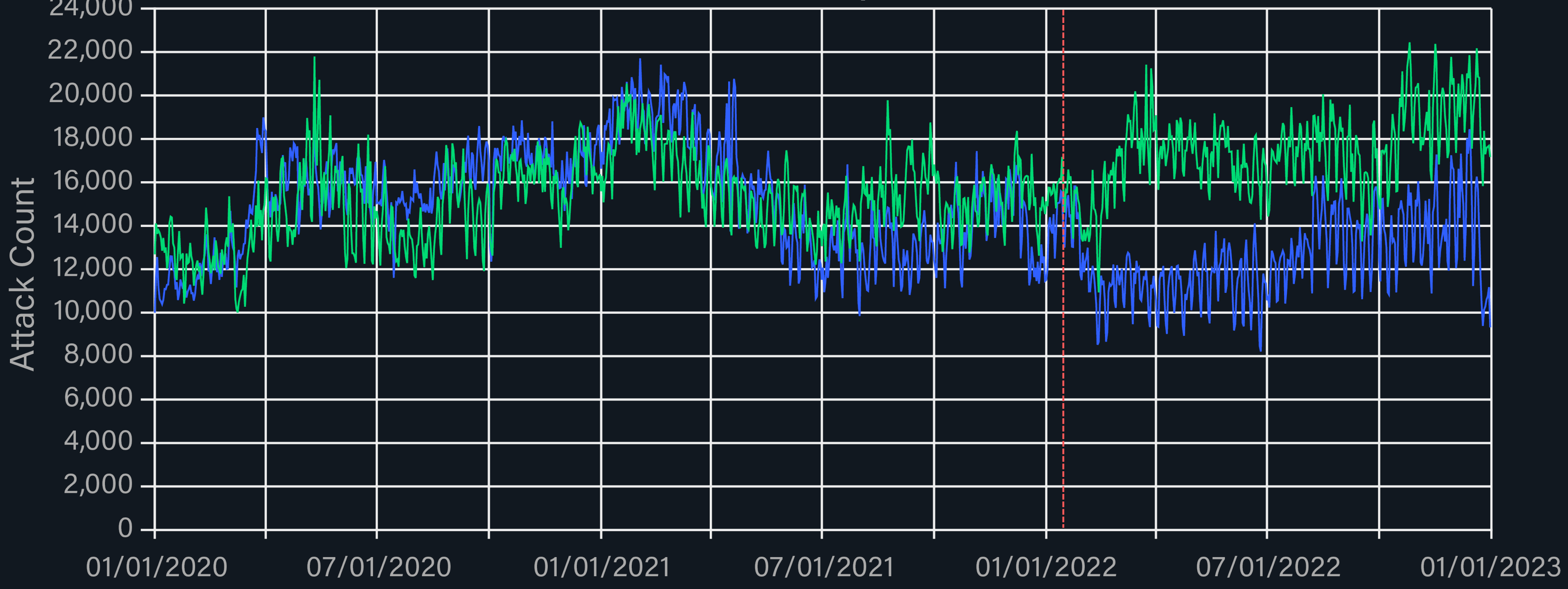
December 2022 – Isolated Effects to Regional Service Providers



Community Security Efforts

Efforts around Best Current Practices (BCPs) in Effect

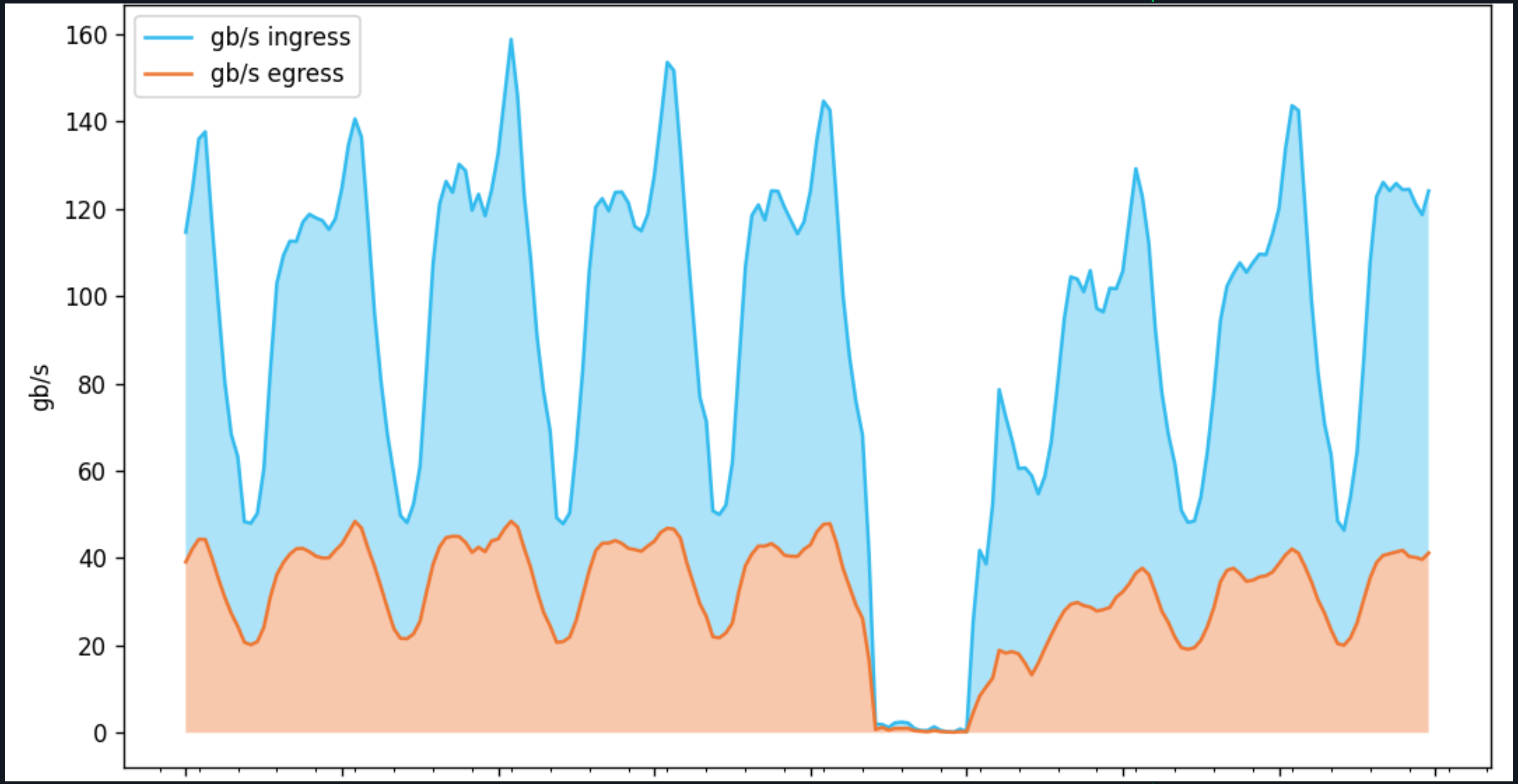
18% decrease in reflection/amplification DDoS attacks



DDoS is an Availability Problem

Remember When We Talked About 400 Tb/s?

Outages become visible with network statistics



Thank you.

John Kristoff, https://www.netscout.com/john-kristoff

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