



Houlihan Lokey



# Cybersecurity Quarterly Update

FOURTH QUARTER 2022

# Global Cybersecurity Team

## U.S. Cyber Team



**Keith Skirbe**  
Managing Director  
Co-Head of U.S. Cyber  
San Francisco



**Bobby Wolfe**  
Director  
Co-Head of U.S. Cyber  
Miami



**Max Schramm**  
Vice President  
New York



**Tyler Deck**  
Vice President  
Boston



**Rishabh Bansal**  
Associate  
San Francisco



**Patrick Wong**  
Financial Analyst  
San Francisco



**Duncan Webber**  
Financial Analyst  
New York

## Capital Markets



**Sean Fitzgerald**  
Managing Director  
New York



**Chris Hebble**  
Managing Director  
Los Angeles

## Global Cyber Reach



**Mark Smith**  
Head of U.K. Cyber  
Manchester



**Malte Abrams**  
Head of Cyber Services  
Frankfurt



**Raiko Stelten**  
Head of Cyber Software  
Frankfurt



**Sara Napolitano**  
Head of Cyber, France  
Paris



**Ido Zakai**  
Head of Tech, Israel  
Tel Aviv



**Gabrielle Worrall**  
Vice President  
Manchester



**Nir Israel**  
Vice President  
Tel Aviv



**Christie Adams**  
Financial Analyst  
Paris



**Samuel Pattison**  
Financial Analyst  
Manchester

## Financial Sponsors

20+

Senior Bankers  
Covering

~1,400

Investors

## Cybersecurity Technology Expertise



**Stephen Lee**  
Tech and Cyber Due Diligence  
Chicago



**Edouard Viot**  
Cybersecurity Consultant  
Paris

# Executive Summary: 2022 in Review

- 2022 proved to be an eventful year in cybersecurity across both the operational environment and capital markets
- Despite macro headwinds, public market declines, and a second-half pullback, cybersecurity M&A and financing activity remained above historical levels, and it was the second most active year on record
- Private equity continued a record pace of investment in cybersecurity, accounting for over 55% of M&A volume
- The breadth of attack types and vectors, coupled with increasing sophistication, necessitates a rapidly evolving solution ecosystem to achieve proactive prevention, detection, and response
- With cybersecurity squarely in the global consciousness, we expect strong activity and interest to continue into 2023

## 2022 Key Trends and Themes



Business email compromise and phishing continue to pose significant threats to protecting corporate data



Ransomware remains prevalent as threat actors extort public- and private-sector targets for large sums



SaaS-like delivery models, notably ransomware-as-a-service, enhance accessibility and expand the bad-actor population



Cyber as the new battleground retakes center stage, with the Russia/Ukraine war highlighting state-sponsored activity

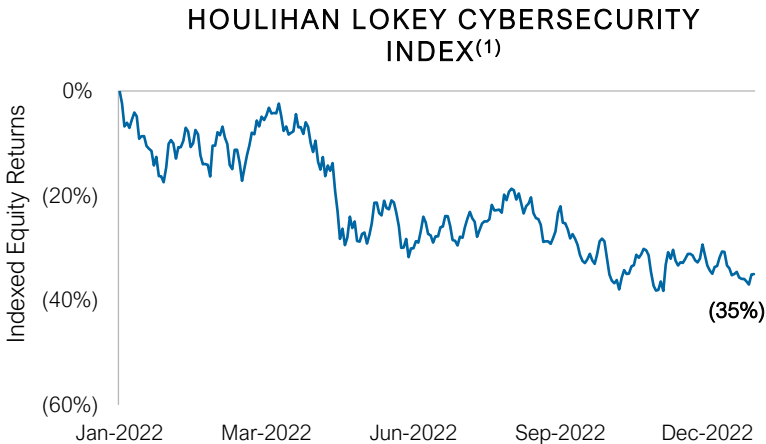


Persistent and evolving identity-based attacks bring new solutions alongside M&A and financing activity



Criticality of cybersecurity and long-term opportunity are underscored by a flurry of large-cap take-private activity

## Challenging Year for Public Companies



## M&A Activity Maintained Pace With 2021

	2022	VS. 2021	VS. 2020
Value	\$47B <sup>(2)</sup>	↓ (44%)	↗ 130%
# of Deals	260 <sup>(2)</sup>	↗ 3%	↗ 37%



\$6.9B



\$4.6B



\$2.8B

## Pullback in Financings to Normalized Levels

	2022	VS. 2021	VS. 2020
Value	\$21B	↓ (32%)	↗ 76%
# of Deals	1,010	↓ (6%)	↗ 23%



\$200M



\$197M



\$175M

Source: S&P Capital IQ as of December 31, 2022.

(1) Houlihan Lokey Cybersecurity Index includes S, CRWD, ZS, PANW, FTNT, SPLK, OKTA, FFIV, CYBR, QLYS, TENB, RPD, DARK, SUMO, RSKD, ABST, WITH, MITK, AVGO, CHKP, 4704, OTEX, BB, SWI, FSECURE, OSPN, TLS, and SCWX.

(2) 2022 M&A deal count and volume does not include Broadcom's pending acquisition of VMware.

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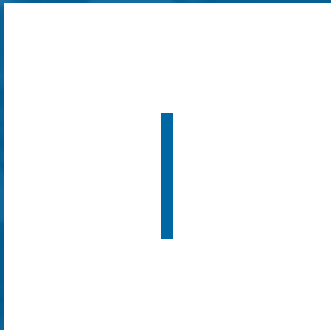
I Perspectives From the Front

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# Perspectives From the Front



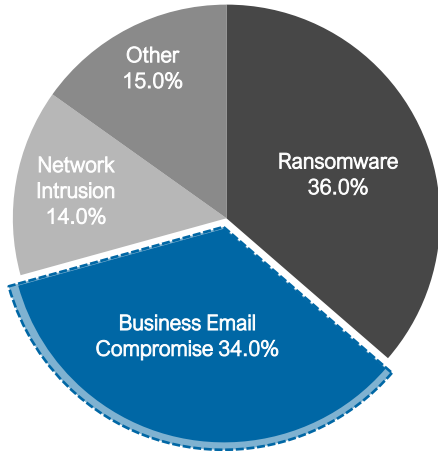
Houlihan Lokey

# Business Email Compromise Remains a Massive Problem

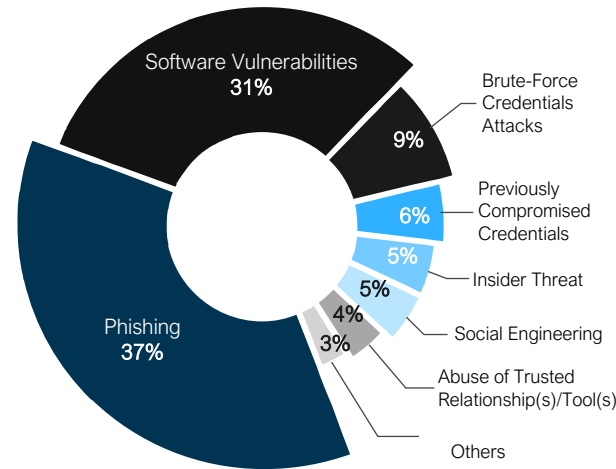
## 2022 Trends and Themes

- Business email compromise (BEC) continues to be a significant challenge for corporations as threat actors constantly create new and more authentic ways of accessing networks
- Attackers are utilizing increasingly sophisticated social engineering, computer intrusion, and emotional manipulation tactics to gain access to corporate networks

## 2022 Most Common Attacks<sup>(1)</sup>



## BEC Initial Attack Vectors<sup>(1)</sup>



## Key Stats



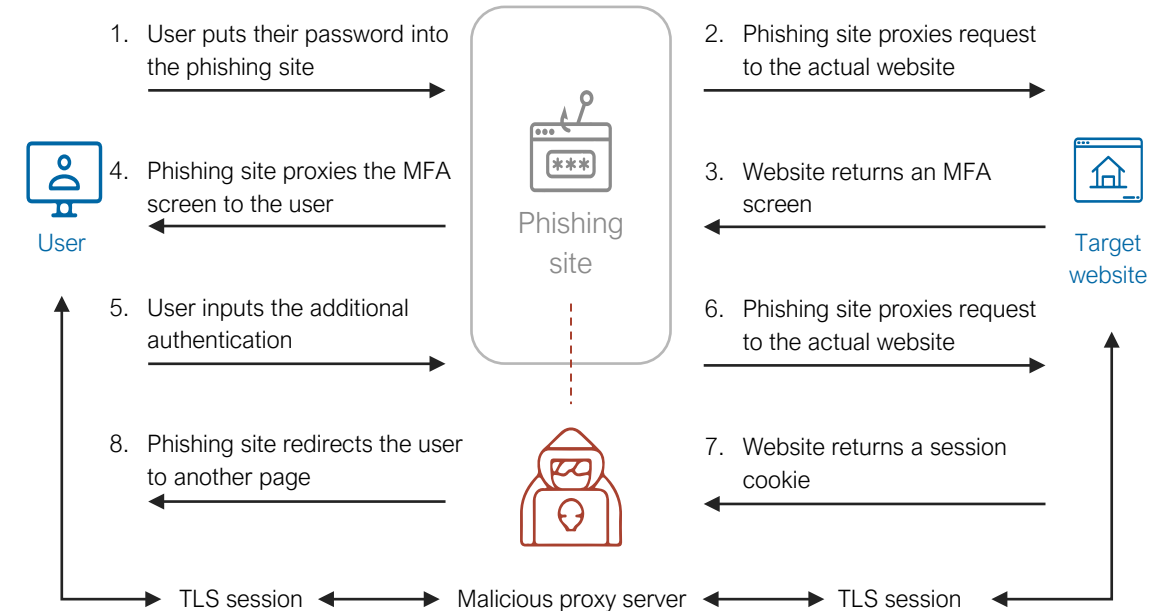
## 2023 Predictions

- Businesses are investing heavily in training and email simulations to enhance the weakest and most vulnerable frontline defenses: employees
- Further, companies need to diversify methods of authenticating devices and adopt more advanced email security solutions that leverage AI language models to detect malicious emails

## Data Breaches

## Evolving Challenges: Phishing Campaign Bypassed MFA

In July, Microsoft researchers uncovered information about a large-scale phishing campaign that used adversary-in-the-middle (AiTM) tactics to hijack a user's sign-in session regardless of whether the user had multifactor authentication (MFA) enabled



Sources: Microsoft: "From Cookie Theft to BEC: Attackers Use AiTM Phishing Sites as Entry Point to Further Financial Fraud"; Forbes: "The 6 Most Common Cyberattacks That Could Impact Companies In 2023."

(1) Palo Alto Networks: 2022 Incident Response Report.

(2) FBI: "Business Email Compromise: The \$43 Billion Scam."

(3) Security Magazine: "Email Cyberattacks Increased 48% in First Half of 2022."

# Ransomware Attacks Created Significant Disruption

## 2022 Trends and Themes

- Ransomware remains a top concern and highly impactful attack method as attackers continue to evade law enforcement and ransomware-as-a-service (RaaS) proliferates
- In 2022, attackers focused on organizations that have highly sensitive data to extort larger ransom payments, namely governments, schools, and hospitals
- Notable attacks include Los Angeles Unified school district, Medibank (Australian insurance provider), and the Costa Rican government
- The number of attacks on public-sector targets has remained consistent over the past several years, suggesting much more needs to be done to combat ransomware

## 2023 Predictions

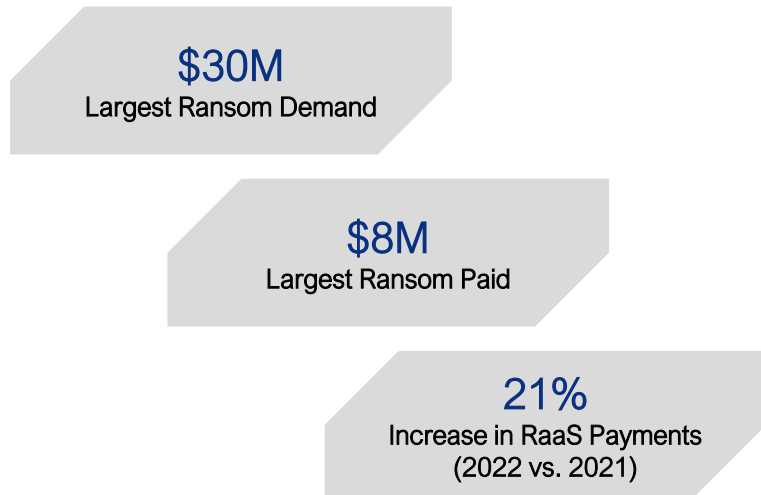
## Data Breaches

### NUMBER OF ATTACKS IN THE U.S.<sup>(1)</sup>



## Key Stats<sup>(2)</sup>

Ransomware was the **second** largest area of concern for cybersecurity leaders and the **third** largest for business leaders<sup>(3)</sup>



## Costa Rica Ransomware Attack

In April 2022, a ransomware attack began against nearly 30 institutions of the Costa Rican government



The pro-Russian Conti Group claimed the first set of attacks and demanded \$20 million<sup>(4)</sup>



Conti attempted an attack against a new government organization almost every day between April 18 and May 2

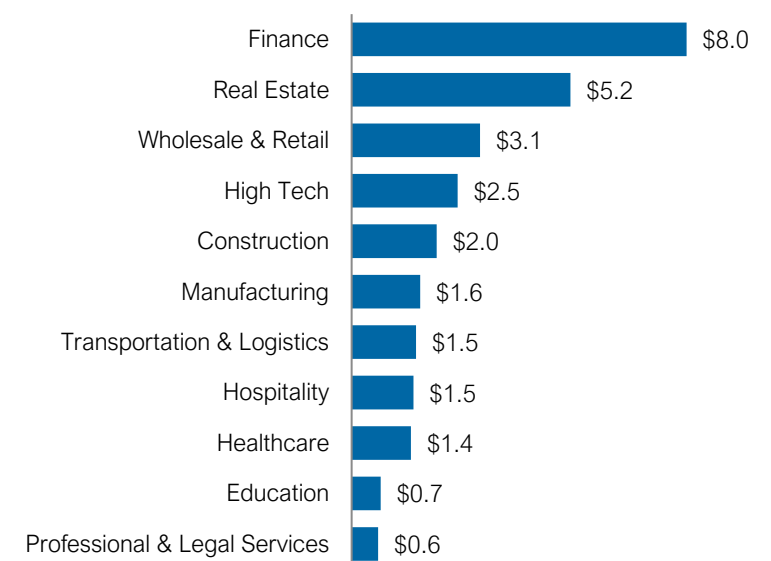


The government shut down critical systems, including those for taxes and import/export management, to defend against the attack



The private sector was heavily impacted by the attack—estimated losses ranged from \$38 million per day to \$63 million per day<sup>(4)</sup>

## Average Ransom Demand by Industry (\$M)<sup>(2)</sup>



Sources: Security Intelligence: "Costa Rica State of Emergency Declared After Ransomware Attacks."

(1) Emsisoft: "The State of Ransomware in the U.S."

(2) Palo Alto Networks: 2022 Unit 42 Incident Response Report.

(3) World Economic Forum: Global Security Outlook 2023.

(4) Wired: "Conti's Attack Against Costa Rica Sparks a New Ransomware Era."

# Ransomware-as-a-Service Gains Significant Traction

## 2022 Trends and Themes

- Ransomware-as-a-service is a subscription model in which affiliates can utilize pre-made ransomware tools to conduct attacks and demand ransoms
- RaaS eliminates the prerequisite of needing an intricate understanding of how to design an attack coupled with the ability to write the necessary code to deploy it, opening the world of ransomware to anyone interested in deploying an attack
- Through the utilization of a software-as-a-service model to break down the barriers of adoption and enhance accessibility, ransomware has proliferated significantly
- Coordinated government legislation and enhanced awareness is expected to help curb ransomware and other cybersecurity threats in the coming years, but until then, new models like RaaS will exacerbate the challenges companies and organizations face

## 2023 Predictions

## Data Breaches

### RaaS Revenue Models



**Monthly Subscriptions:** Flat fee



**Affiliate Programs:** Monthly fee plus percent of profits



**One-Time License:** No profit-sharing



**Pure Profit-Sharing:** Sharing revenues

### Prominent RaaS and Key Stats<sup>(1)(2)</sup>

#### HIVE

An affiliate-based ransomware variant that was widely used to target more than 1,500 victims in more than 80 countries from July 2021 until the FBI disrupted it in July 2022



**\$100M+**  
Extorted Since June 2021  
by Hive Group

#### REvil

A Russia-based RaaS operation that accounted for over 37% of all ransomware attacks in 2021; REvil remained in operation until early 2022, when Russia dismantled the group



**\$10M**  
Ransom Demanded  
Using REvil

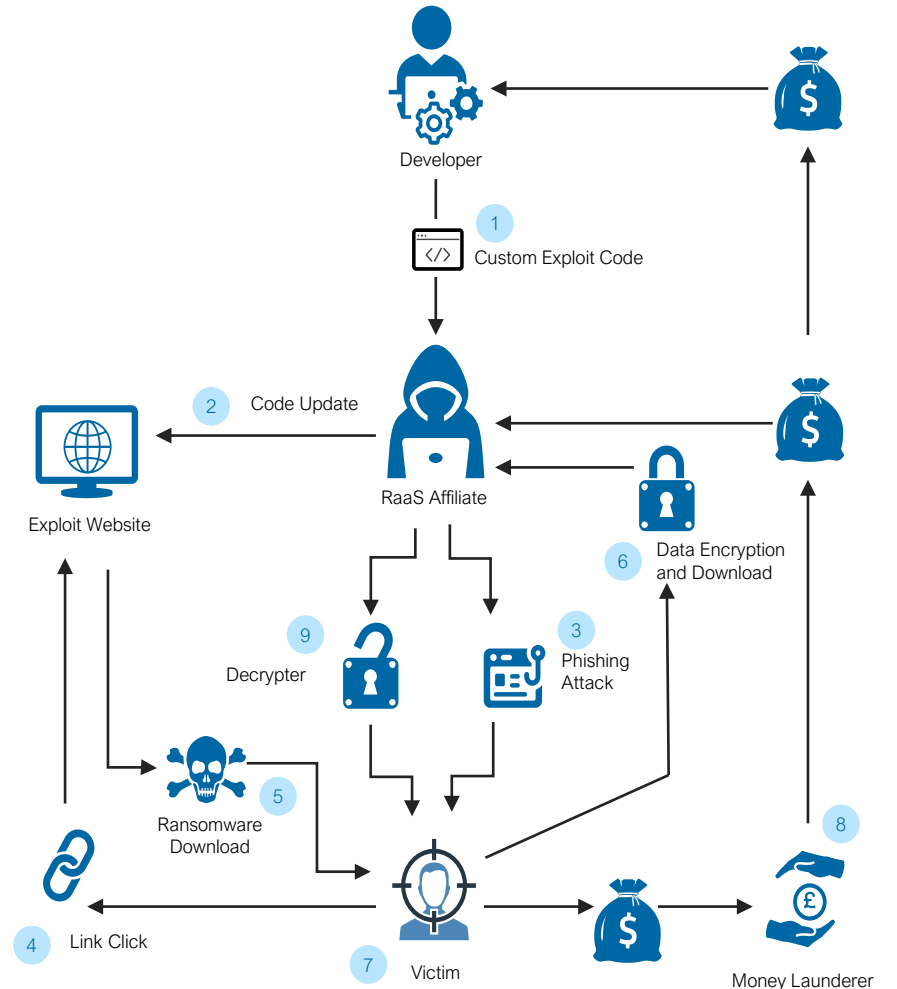
#### DARKSIDE

A RaaS operation associated with e-crime group Carbon Spider that has impacted organizations in more than 15 countries



**100GB / \$5M**  
Colonial Pipeline Data  
Stolen / Ransom Paid

### RaaS Breakdown



Sources: UpGuard: "What Is Ransomware as a Service?"; Fortinet: "Ransomware-as-a-Service Is Fueling the Threat Landscape"; Cybercrime Magazine: "Top 10 Cybersecurity Predictions and Statistics for 2023."

(1) CrowdStrike: "Ransomware as a Service (RaaS) Explained."

(2) Mandiant: "Shining a Light on DARKSIDE Ransomware Operations."



# Russia / Ukraine War Brings Nation-State Threat Actors to Forefront

## 2022 Trends and Themes

- The issue of state-sponsored threat actors became front and center again when Russia invaded Ukraine and the use of cybersecurity tactics were thrust in the spotlight
- Cybersecurity efforts by nation-state-affiliated groups outside of Russia—notably China, Iran, and North Korea—also made headlines and highlighted the ability of cybersecurity tactics to effect a country's agenda

## 2023 Predictions

- Global awareness of Russian cyberattacks and the potential spillover effects from large-scale cybersecurity war bolstered cybersecurity investment and focus
- State-sponsored cyberattacks in 2022 remained persistent, particularly amid the invasion of Ukraine, as espionage and physical disruption became amplified

## Data Breaches

## War in Ukraine Exemplifies the Breadth and Velocity of Cyberwarfare

### EXTENSIVE USE OF WIPER MALWARE

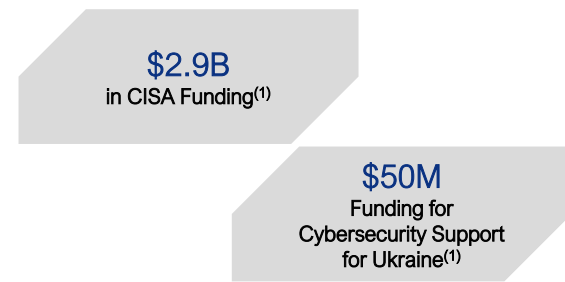


### SELECT RUSSIAN ATTACKS

- Mar 30** Russian advanced persistent threat (APT) group was caught targeting NATO, Eastern European, American NGOs, and Balkan military through phishing
- Apr 22** Ukrposhta, Ukraine's national postal service, was hit by DDoS
- May 6** Russia used "CredoMap\_V2" in a malicious email in an attempt to steal authentication data
- June 6** Phones of Ukrainian officials were targeted by hackers in Russia
- Dec 6** VTB Bank, Russia's second-largest financial institution, was targeted by cybersecurity forces operating from Ukraine

### IMPACT ON THE WEST

- In late December, the House and Senate committees agreed to increase funding for various cybersecurity initiatives, including the Cybersecurity and Infrastructure Security Agency (CISA), Ukraine, and Department of Homeland Security
- In September, the Biden administration announced \$1 billion in funding for the first ever state and local cybersecurity grant program



## Other State-Sponsored Cyber Efforts

In early 2022, it was discovered that a hacking group affiliated with the Chinese government carried out a months-long espionage program against Taiwan's financial sector



Hackers backed by the Iranian government have targeted at least 18 other high-profile activists, journalists, researchers, academics, diplomats, and politicians



North Korean hackers have stolen an estimated \$1.2 billion in cryptocurrency and other virtual assets in the past five years to fund the country's missile program



# Identity Remains Top of Mind of as Breadth of Attacks Grows

## 2022 Trends and Themes

- Driven by the evolving macro environment, the identity sector's rapid growth continues as the importance of protecting enterprises, employees, and consumers from identity-based attacks has become increasingly common and difficult to combat
- With the acceleration of remote work and digitization since 2020, the amount of data and number of digital interactions has exploded, enabling bad actors seeking to exploit both

### Identity Theft Protection

Identity Theft Protection

Password Managers

Personal Identity Products

Self-Sovereign Identity (SSI)

- Provide software and services to reduce the risk of ID theft and continued monitoring to track unauthorized use of personal information

### Fraud Detection

User and Entity Behavior Analytics

Fraud Prevention and Risk Management

Endpoint Malware Detection

Bot Detection

- Provide tools to monitor user behavior and transactions in real time to detect suspicious activity and prevent account fraud

### Enterprise Identity

Identity Governance and Administration

Privileged Access Management

Identity-as-a-Service

SSO

- Define and manage the roles and access privileges of individual network users and the circumstances in which they have privileges

## 2023 Predictions

- The most susceptible are industries responsible for critical infrastructure, including energy, finance, healthcare, telecom, and transportation
- Solutions across the ecosystem are garnering significant attention, adoption, and investment, validating the long-term secular tailwinds of protecting against identity-based attacks

### Identity Authentication

Mobile Identity and Device Management

Multifactor Authentication

FIDO Authentication

Token Access

- Provide recognition technology for a user's identity by associating an incoming request with a set of identifying credentials

### Identity Proofing

Know Your Customer and Entity Verification

Identity and Document Verification

Identity Proofing

Background Screening

- Verify and affirm the true identity of an individual interacting with an organization for the first time, based on document attributes

### Data Aggregation

Alternative Credit and Financial History

Master Data and Consent Management

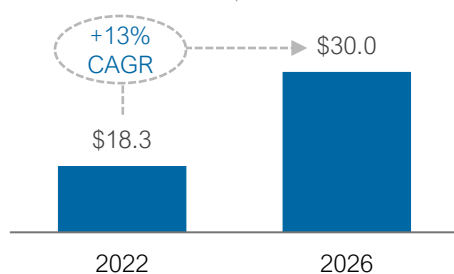
Credit Scoring

Data Aggregators

- Gather identity data from multiple sources and combine them into a summary analysis to present a single view of an individual

## Strong Growth in Spend

(market size, \$ in billions)



## Strong M&A Activity and Marquee Transactions

2022	(\$ in millions)				
Deals: 44	Ann. Date	Acquirer	Target	EV	EV/Rev
Value: \$13.2B	Oct-22	THOMABRAVO	ForgeRock	\$2,252	12.0x
	Aug-22	THOMABRAVO	PingIdentity	\$2,800	9.1x
	May-22	LexisNexis	BehavioSec	\$130	17.5x
	Apr-22	THOMABRAVO	SailPoint	\$6,900	15.0x
	Mar-22	SentinelOne	Attivo NETWORKS	\$617	17.6x

## Significant Investment in Category Leaders

2022	(\$ in millions)				
Deals: 121	Ann. Date	Investor(s)	Target	Amt.	Val.(1)
Value: \$1.8B	Sep-22	Avenir Lightspeed	ALLOY	\$152	\$1,550
	Aug-22	PSG	bitwarden	\$100	NA
	May-22	KKR	semperis	\$200	NA
	Apr-22	Goldman Sachs Asset Management	UNICO	\$100	\$2,600
	Jan-22	ICONIQ	1Password	\$620	\$6,800

Sources: PitchBook; 451 Research as of December 31, 2022.

Note: Summary based on known deal amounts only (actuals to be higher). NA indicates not publicly available. 2022 M&A deal volume includes Broadcom's pending acquisition of VMware.

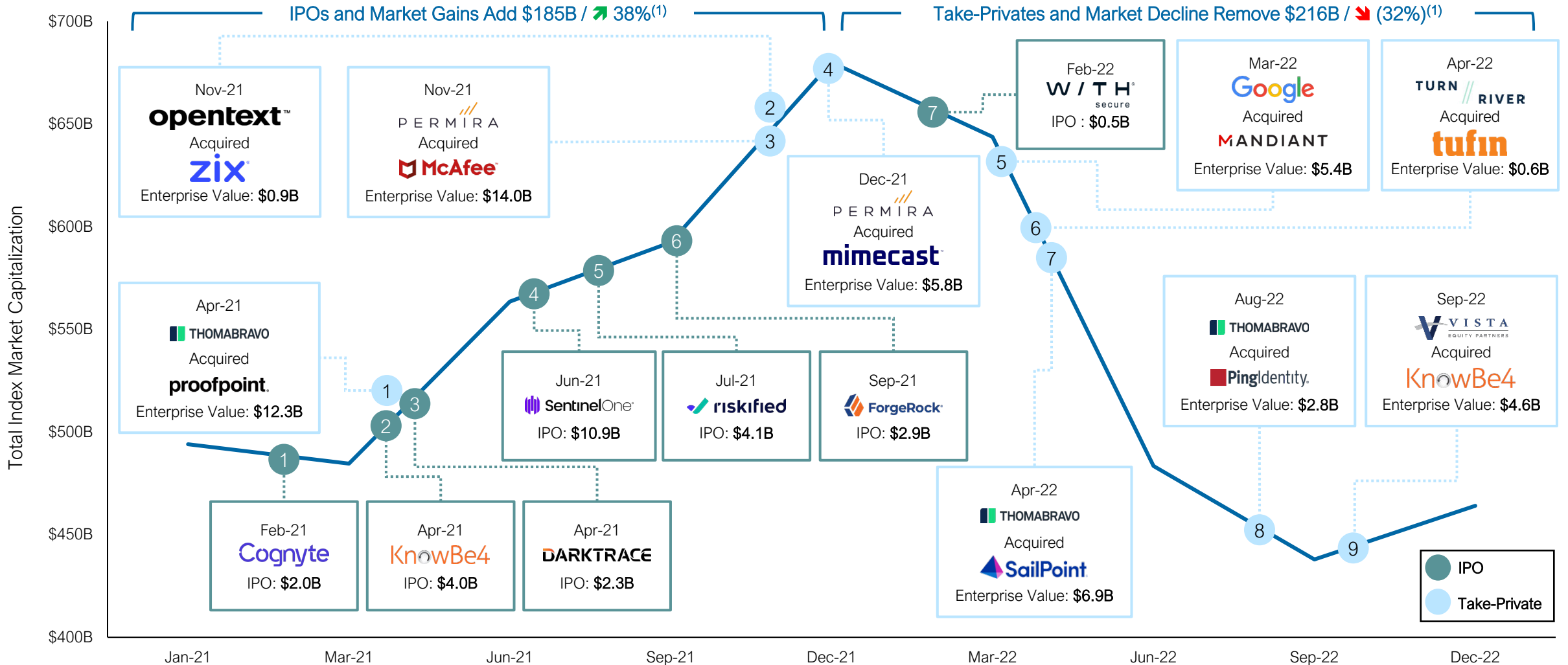
(1) Valuation reflects estimated post-money valuation.

# Total Market Capitalization in Cybersecurity Declined 32% in 2022, Driven by Market Conditions and Take-Privates

2022 Trends and Themes

2023 Predictions

Data Breaches



Sources: Press release; PitchBook; S&P Capital IQ.  
 Note: IPO amount represents market capitalization at time of IPO.  
 (1) Value reflects market cap.

# Cybersecurity Predictions for 2023

## 2022 Trends and Themes

## 2023 Predictions

## Data Breaches

### Phishing Escalations



- While phishing has become a top access vector in recent years, cybercriminals are moving toward SMS phishing (smishing) to infiltrate their targets
- Training initiatives for new compromising tactics will become increasingly important for organizations

### Supply Chain Risks



- Nearly 40% of organizations worldwide are expected to experience cybersecurity incidents within their supply chains
- Application programming interfaces (APIs) are expected to continue to be tested, as organizations rely heavily on third-party partners

### Hackers-for-Hire



- With expectation of a global recession, there is a risk of an increasing supply of hackers-for-hire in search of pay
- The proliferation of cybercrime worldwide and use of software-as-a-service models permit criminals to share tactics easily, lowering the barrier to entry for less experienced hackers

### State-Sponsored Attacks



- State-sponsored crime is a heightened threat compared with previous years, as Russia, China, and Iran are all currently involved in conflict
- These and other nation-state actors will use cybersecurity tactics to advance their objectives as part of both outright conflict and covert operations

### MFA Bypass Techniques



- As multifactor authentication (MFA) is more widely adopted, new MFA vulnerabilities and bypass techniques are expected in 2023
- The most common way cybercriminals will sidestep these solutions is through smart social engineering and MFA push notification impersonations

### Acquisitions ≠ Consolidation





- Experts predict there will be nearly 400 cybersecurity M&A transactions in 2023
- Although M&A activity is expected to increase, a continued influx of cybersecurity startups will counteract consolidation in this constantly evolving field

# Data Breaches: WhatsApp

## 2022 Trends and Themes

### Breach Overview

<b>Company Description:</b>	A cross-platform instant messaging app
<b>Date of Breach:</b>	November 2022
<b>What Happened:</b>	A hacker uploaded up-to-date personal information of WhatsApp users to a well-known hacking site
<b>Total Users Impacted:</b>	487 Million <sup>(1)</sup>
<b>Cost of Select Data Sets:</b>	 \$7K Price in the U.S. <sup>(2)</sup>  \$2.5K Price in the U.K. <sup>(2)</sup>

### Top 5 Countries Impacted<sup>(2)</sup>

(Users impacted)



Sources: Cybernews; CNBC.

(1) Dataconomy: "Your WhatsApp Data May Be on Sale on the Dark Web!"

(2) Cybernews: "WhatsApp Data Leaked—500 Million User Records for Sale Online."

## 2023 Predictions

### Attack Methodology and Rationale



To date, how exactly the hackers breached WhatsApp is unknown, though it is suspected that they exploited security bugs or API scraping



Hackers use stolen phone numbers for smishing (phishing via text message) and vishing (phishing via phone calls or voicemails) to fraudulently obtain personal information

### Expert Opinions and Commentary



"Implementing strong identity-based access controls is one way to mitigate this threat and associated challenges."

- Almog Apirion, CEO and Co-Founder, Cyolo



"There is the potential that this information could be used as part of tailored phishing attacks in the future."

- Deryck Mitchelson, Field CISO EMEA, Check Point Software



"In this age, we all leave a sizeable digital footprint—and tech giants like Meta should take all precautions and means to safeguard that data."

- Manatas Sasnaukas, Head of Cybernews Research

## Data Breaches

### The Outcome

WhatsApp has actively denied that any breach has occurred



While the claim may be purely speculative, sources were able to obtain a sample from the data leak and confirm that the phone numbers belong to WhatsApp users



Parent company Meta has long been criticized for letting third parties collect unsolicited data in events like the massive Facebook data leak, which contained data from more than 500 million LinkedIn profiles



WhatsApp has declined to comment further on the issue

### Key Takeaways



#### Limiting the Damage

It is crucial for organizations that have experienced data breaches to promptly educate their customers on how to protect themselves from phishing and smishing attempts



#### More Advanced Security Measures

Implementing multifactor authentication or other identity-based access controls may decrease the risk of security breaches

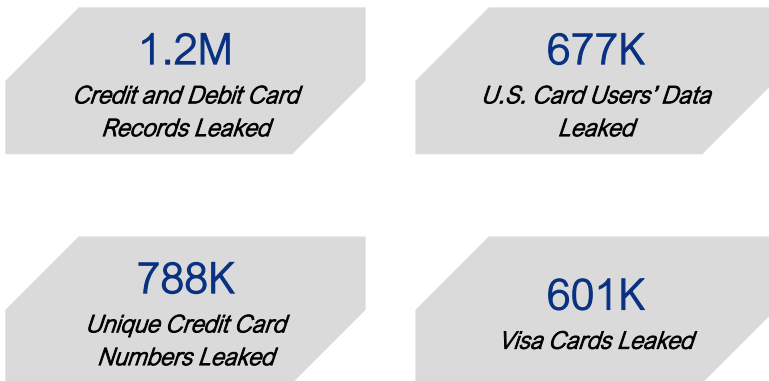
# Data Breaches: BidenCash

## 2022 Trends and Themes

### Breach Overview

<b>Date of Breach:</b>	October 2022
<b>Carding Forum:</b>	BidenCash
<b>What Happened:</b>	A dark web carding market named "BidenCash" released a massive dump of credit cards to promote their marketplace
<b>Percent of U.S. Breaches:</b>	Accounted for 10% of total people impacted in U.S. breaches <sup>(1)</sup>
<b>Top 5 Card Types Impacted:</b>	Visa, Mastercard, American Express, Rupay, and China Union Pay

### Key Stats<sup>(3)</sup>



## 2023 Predictions

### BidenCash Background

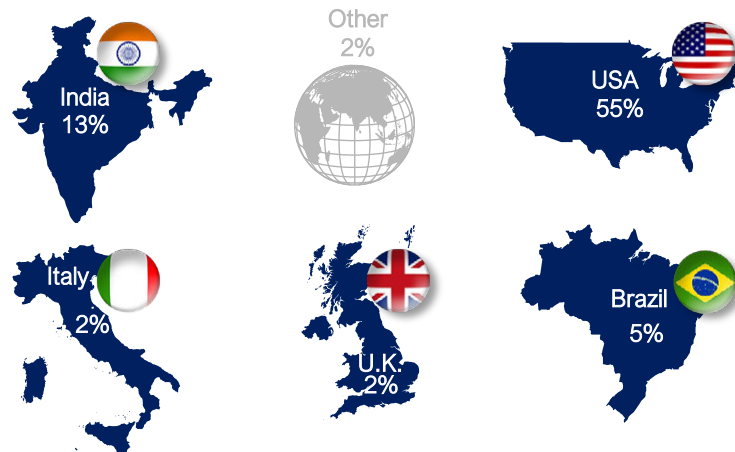


- Analysts at D3Labs say it is likely that information was gathered via web skimmers, which are malicious scripts injected into checkout pages of hacked e-commerce sites that steal submitted credit card and customer information



- While the stolen information is authentic, many of the entries were recycled from previous data dumps, such as the "All World Cards" free giveaway from last year
- From data examined so far, only 30% of the information appears to be fresh <sup>(2)</sup>

### Breakdown of Countries Impacted<sup>(4)</sup>



## Data Breaches

### The Outcome



- Analysts at D3Labs were able to validate the information and confirm that it corresponded to real credit cards and real holders



- Banks in Italy have confirmed that approximately half the cards impacted by the release have already been blocked for fraudulent activity
- Other banks around the world are keeping a dynamic monitoring process to help detect and mitigate fraud

### Key Takeaways

In order to better protect people's information from carding attacks, companies need to better invest in detection methods to ensure the right people are accessing the right information



#### Device Fingerprinting

Device fingerprinting implemented in login portals creates a unique ID for a specific device using a specific browser, which can help to flag fraud if the same ID is using multiple logins



#### Browser Validation

Browser validation checks if the browser is real and behaving as a normal human would, combating bots that can pose as different browsers to change their device ID and avoid detection

Sources: Wired: "What Twitter's 200 Million-User Email Leak Actually Means"; Firewall Times: "Twitter Data Breaches: Full Timeline Through 2023"; Financial Press: "Twitter's Data Leak Is a Lesson in How Not to Do Cybersecurity"; Meijerink, Tristan: "Carding: Crime Prevention Analysis."

(1) Security Magazine: "BidenCash Breach Accounted for 10% of U.S. Breaches in 2022."

(2) Bleeping Computer: "Darkweb Market BidenCash Gives Away 1.2 Million Credit Cards for Free."

(3) Cyble: "BidenCash Strikes Again: Over 1.2 Million Compromised Payment Cards Data Leaked."

(4) SpyCloud: "Dark Web Market BidenCash: 30%+ of Credit Cards Are Old News."

## 2022 Trends and Themes

### Breach Overview

**Company Description:** The second-largest wireless carrier in Australia

**Date of Breach:** September 2022

**What Happened:** Millions of former and current customers' data was stolen

**Total Customers Impacted:** ~10 Million<sup>(1)</sup>

**Ransom Threat:** \$1M USD<sup>(1)</sup>

### Key Stats<sup>(1)</sup>



**~2.8M**  
customers are marked as having a "quite significant" risk of identity theft and fraud



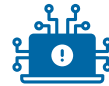
**10K**  
customer records were released, but were later removed

## 2023 Predictions

### How Did the Breach Happen?

The breach exploited a publicly accessible and unprotected API, which didn't require user authentication prior to establishing connections

#### CRITICAL FLAWS



**Publicly accessible API**—APIs should not be public-facing if they facilitate access to sensitive internal data; APIs provide a direct connection to a backend system and its data



**Insufficient protection of sensitive data**—The API in question facilitated access to backend processes that call upon sensitive customer records, exposing dates of birth, addresses, and other sensitive, personal data



**Unsophisticated customer IDs**—Customer identifiers differed by an increment of 1, creating sequential customer IDs that were easily obtained (e.g., 1734, 1735, 1736, etc.)

### Expert Opinions and Commentary



"In the instance where a public API endpoint did not require authentication, anyone on the internet with knowledge of that endpoint could use it."

- Corey J. Ball, Senior Manager, Pentest Consulting



"What happened at Optus wasn't a sophisticated attack. We should not have a telecommunications provider in this country that has effectively left the window open for data of this nature to be stolen."

- Clare O'Neil, Australian Minister for Cybersecurity

## Data Breaches

### The Outcome



Optus CEO Kelly Bayer Rosmain said the attack was sophisticated and that the company has very strong cybersecurity; however, many experts disagree



In a later escalation, 10,000 customer records were released as the hacker reiterated the deadline; the records were taken down hours later with the attacker saying it had been a mistake



Experts believe that a class-action lawsuit could soon be filed against Optus

### Key Takeaways



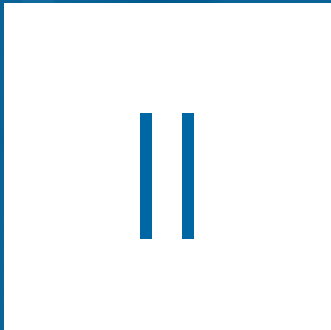
#### Improving Cybersecurity Resources

Organizations should implement proper measures to ensure the secure handling of customer data, including having a fully staffed and competent IT team that is well versed in the latest cybersecurity trends and standards



#### The Importance of Secure API Design

As APIs become increasingly more common, it is crucial to follow the best practices for API security to prevent data breaches



# Capital Markets and Trends Update





# Cybersecurity Dashboard

## Public Market Environment

In line with the broader market, cybersecurity companies experienced a drop in public performance in 2022



High-Growth Index Performance<sup>(1)</sup>

⬇️ (37%) | ⬇️ (58%)  
Q422 | CY22



Medium-Growth Index Performance<sup>(2)</sup>

⬇️ (9%) | ⬇️ (39%)  
Q422 | CY22



Low-Growth Index Performance<sup>(3)</sup>

⬆️ 5% | ⬇️ (17%)  
Q422 | CY22

### Select Cybersecurity Performance 2022

**ABSOLUTE**

⬆️ 11.5%

**CHECK POINT**

⬆️ 8.2%

**paloalto**

⬇️ (24.8%)

**CYBERARK**

⬇️ (25.2%)

**splunk**

⬇️ (25.6%)

**FORTINET**

⬇️ (32.0%)

**CROWDSTRIKE**

⬇️ (48.6%)

**RAPID7**

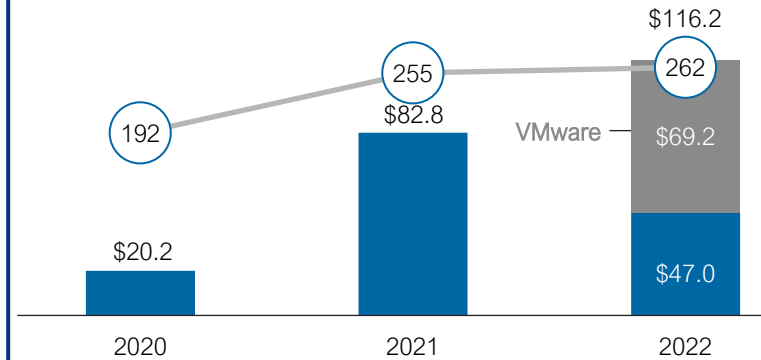
⬇️ (71.1%)

## M&A Environment

Take-private transactions have increased as PE firms seek to take advantage of lower valuations in public markets

(\$ in billions)

■ Value —○— Number of Deals



### Select Q4 Transactions

(\$ in millions)

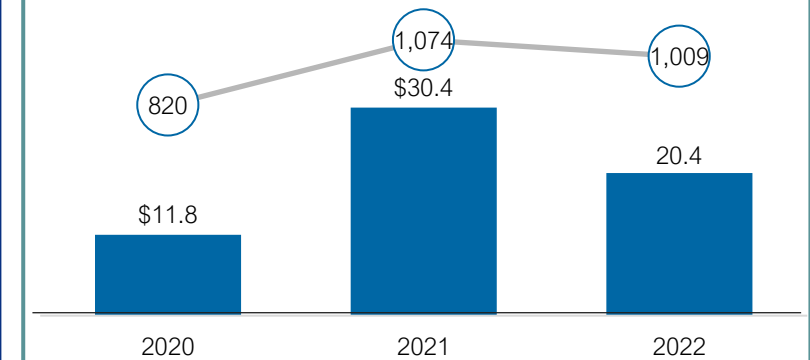
Ann. Date	Acquirer	Target	EV	EV/Rev
Dec-22	proofpoint.	illusive	\$100	NA
Nov-22	paloalto	Cider	\$195	NA
Oct-22	VISTA EQUITY PARTNERS	KnowBe4	\$4,600	14.9x
Oct-22	VOLPI CAPITAL	XALIENT	Conf.	Conf.
Oct-22	THOMABRAVO	ForgeRock	\$2,300	12.0x

## Private Funding Environment

Despite an uncertain and volatile macroeconomic environment, cybersecurity funding hit \$20.8 billion in 2022, expectedly off peak 2021 levels, but up 75% over 2020

(\$ in billions)

■ Capital Invested —○— Number of Deals



### Select Q4 Financings

(\$ in millions)

Ann. Date	Investor	Target	Amt.	Val.
Dec-22	VECTOR CAPITAL	Malwarebytes	\$100	NA
Dec-22	QIAB QATAR INVESTMENT AUTHORITY	snyk	\$197	\$7,400
Dec-22	ICONIQ	DRATA	\$200	\$2,000
Nov-22	> < DRAGONFLY	Matter Labs	\$200	NA
Oct-22	BlackRock	VERSA NETWORKS	\$120	\$800

Source: S&P Capital IQ as of December 31, 2022.

Note: 2022 M&A deal volume includes Broadcom's pending acquisition of VMware.

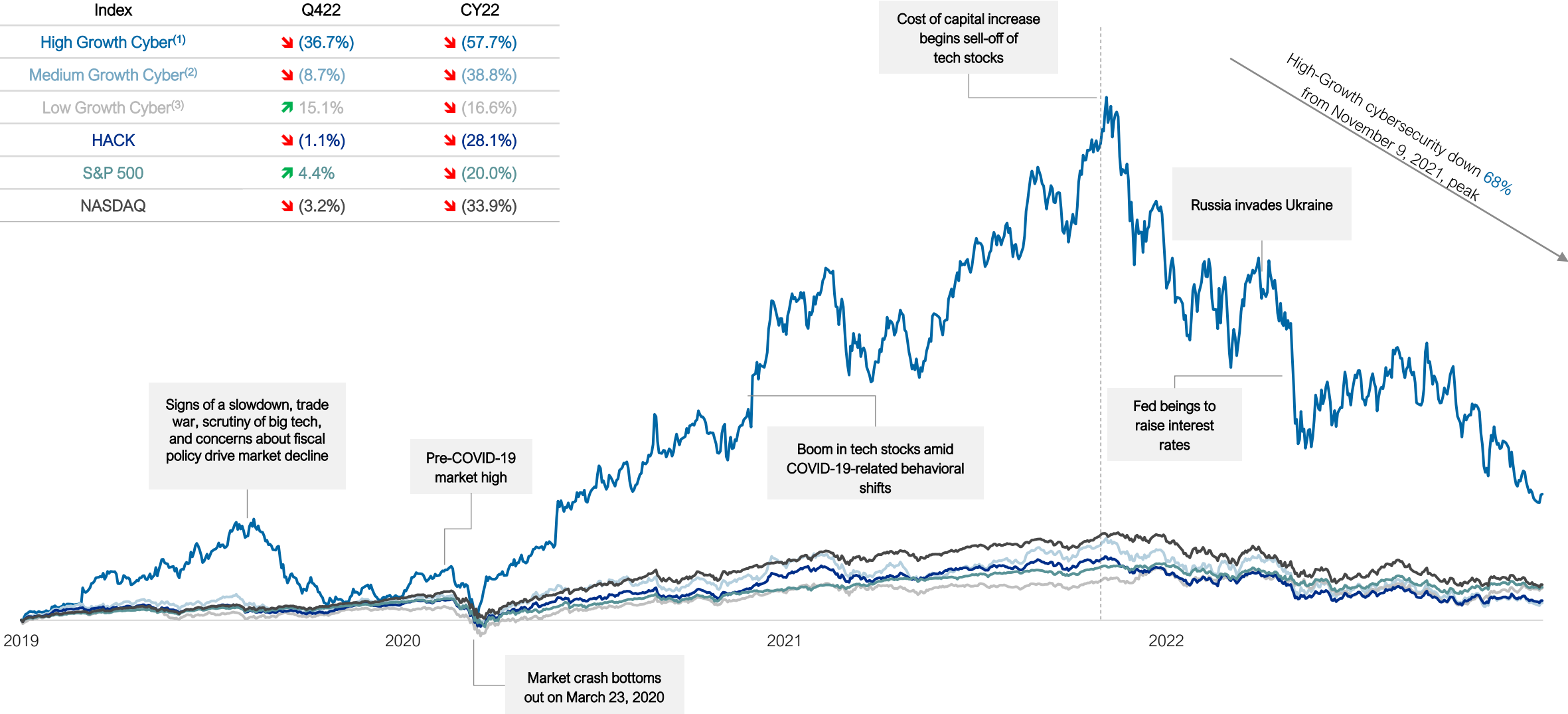
(1) High-Growth Cybersecurity includes S, CRWD, and ZS.

(2) Medium-Growth Cybersecurity includes PANW, FTNT, SPLK, OKTA, FFIV, CYBR, QLYS, TENB, RPD, DARK, SUMO, RSKD, ABST, WITH, and MITK.

(3) Low-Growth Cybersecurity includes AVGO, CHKP, 4704, OTEX, BB, SWI, FSECURE, OSPN, TLS, and SCWX.

# Despite Correction, High-Growth Cybersecurity Remains Above Pre-COVID-19 Levels

Index	Q422	CY22
High Growth Cyber <sup>(1)</sup>	↓ (36.7%)	↓ (57.7%)
Medium Growth Cyber <sup>(2)</sup>	↓ (8.7%)	↓ (38.8%)
Low Growth Cyber <sup>(3)</sup>	↑ 15.1%	↓ (16.6%)
HACK	↓ (1.1%)	↓ (28.1%)
S&P 500	↑ 4.4%	↓ (20.0%)
NASDAQ	↓ (3.2%)	↓ (33.9%)

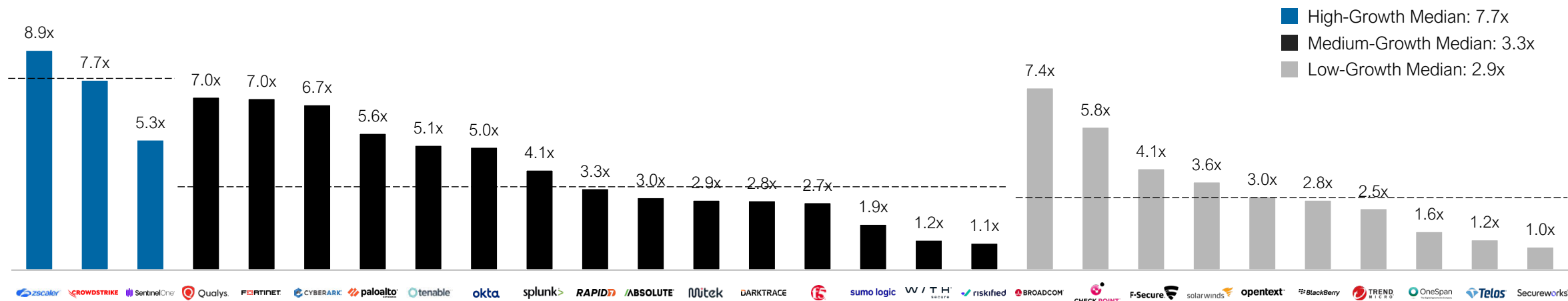


Source: S&P Capital IQ as of December 31, 2022.

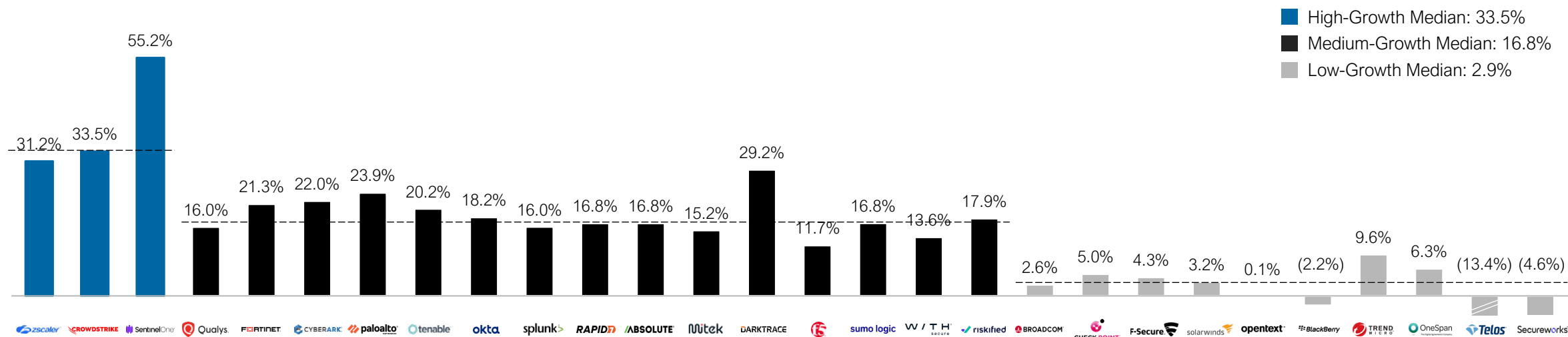
(1) High-Growth Cybersecurity includes S, CRWD, and ZS.  
 (2) Medium-Growth Cybersecurity includes PANW, FTNT, SPLK, OKTA, FFIV, CYBR, QLYS, TENB, RPD, DARK, SUMO, RSKD, ABST, WITH, and MITK.  
 (3) Low-Growth Cybersecurity includes AVGO, CHKP, 4704, OTEX, BB, SWI, FSECURE, OSPN, TLS, and SCWX.

# Public Company Benchmarking: Cybersecurity Software

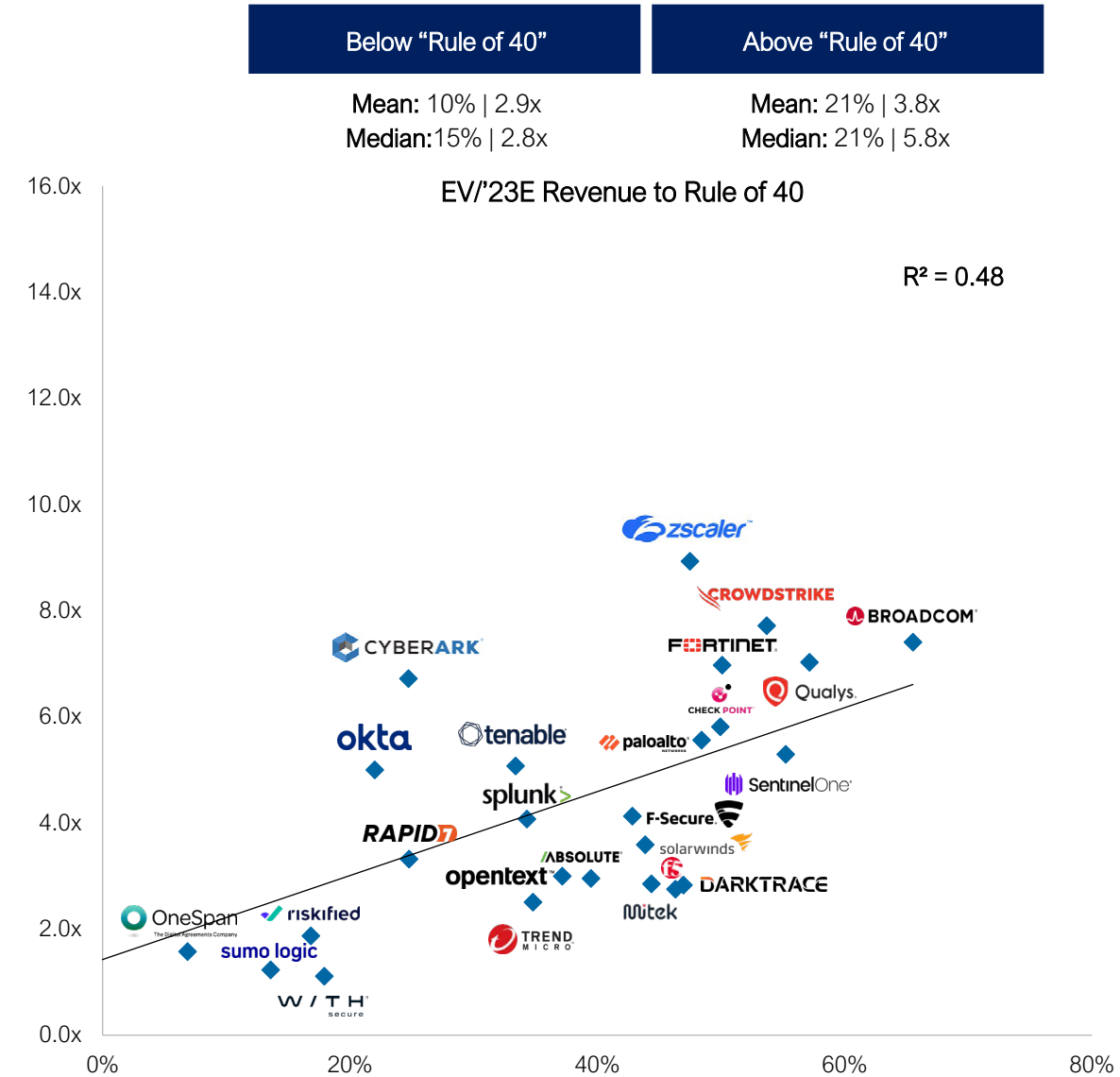
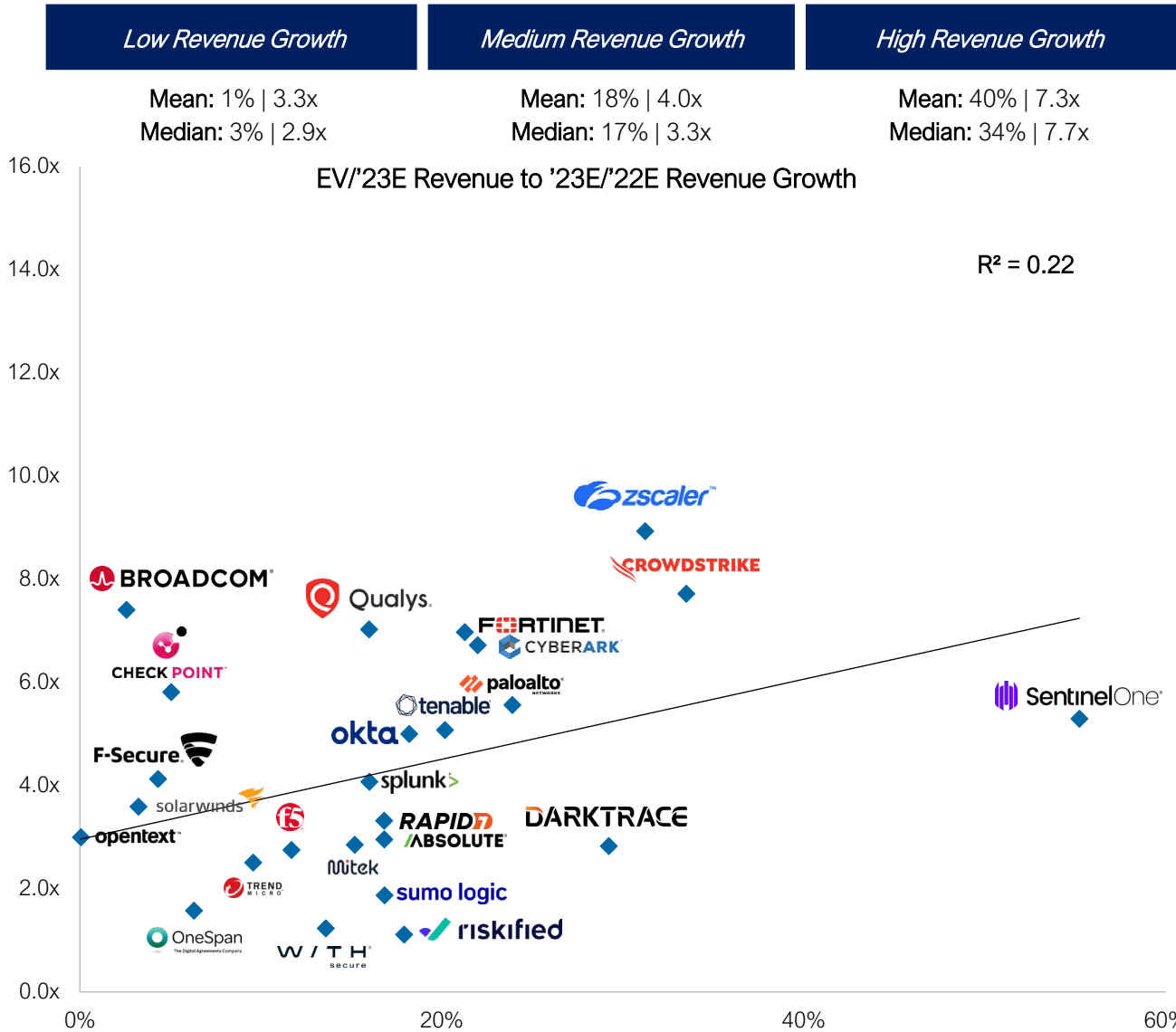
## EV/2023E Revenue



## CY 2022E–2023E Revenue Growth



# Public Investors Remain Focused on Growth and Profitability



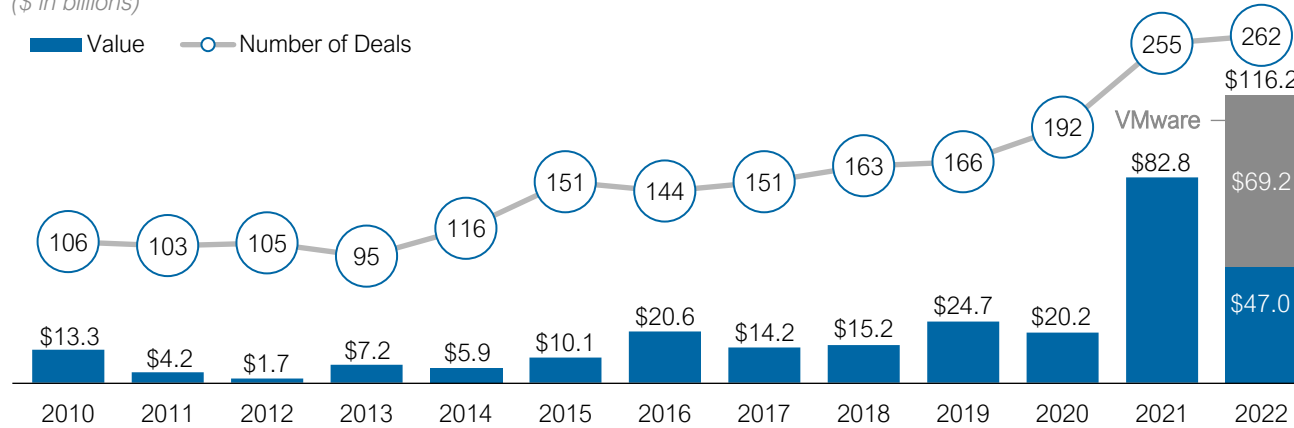
Source: Trading multiples are based on share price, other market data, and broker consensus future earnings estimates from S&P Capital IQ as of December 31, 2022. All financials calendarized to a December year-end. Note: TLS, BB, and SCWX are included in the calculation for R<sup>2</sup> but are not included in the charts due to having negative values for either Revenue Growth or Rule 40.

# Strong Demand for Cybersecurity Assets

## Annual M&A Summary

(\$ in billions)

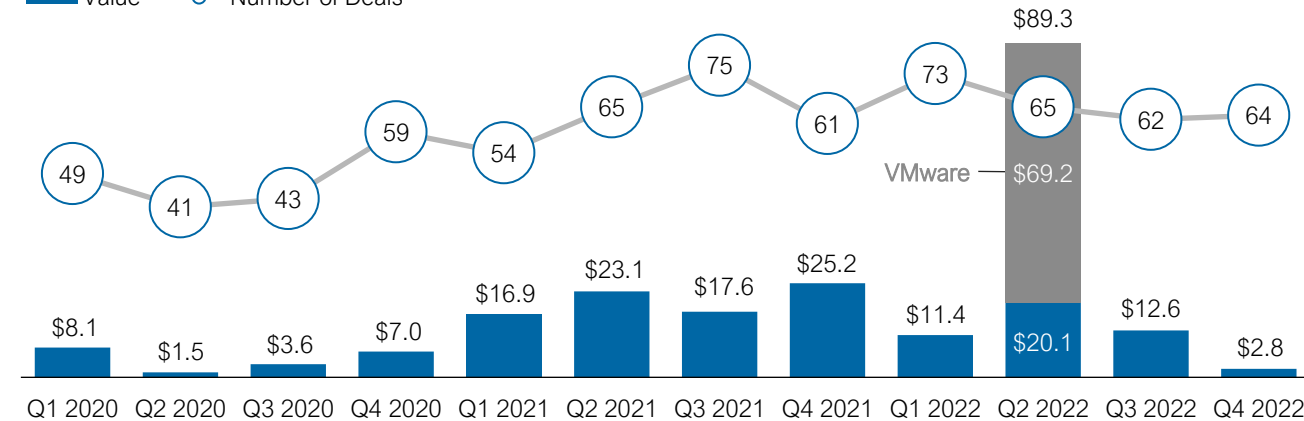
■ Value —○ Number of Deals



## Quarterly M&A Summary

(\$ in billions)

■ Value —○ Number of Deals



## Select M&A Transactions

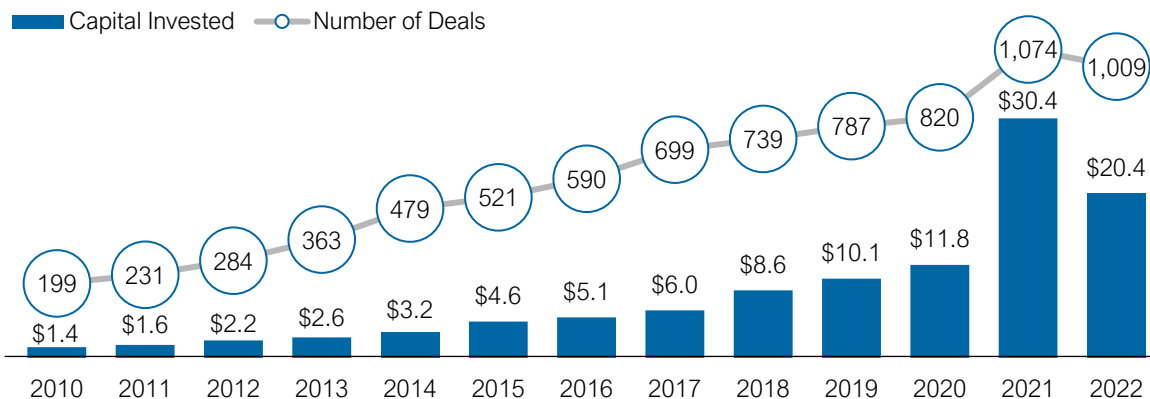
(\$ in millions)

Ann. Date	Acquirer	Target	EV	EV/Rev
Dec-22	proofpoint.	illusive	\$100	NA
Nov-22	paloalto NETWORKS	Cider	\$195	NM
Oct-22	VISTA EQUITY PARTNERS	KnowBe4	\$4,600	14.9x
Oct-22	THOMABRAVO	ForgeRock	\$2,300	12.0x
Aug-22	THOMABRAVO	PingIdentity	\$2,796	9.1x
Jul-22	THALES	onewelcome	\$102	NA
Jun-22	Charter COMCAST (Joint Venture)	LevL	\$50	NA
Jun-22	RELIAQUEST	digital shadows	\$160	6.4x
May-22	PARSONS	Xator CORPORATION	\$400	1.3x
May-22	LexisNexis	BehavioSec	\$130	17.5x
Mar-22	SentinelOne	Attivo NETWORKS	\$616	17.6x
Mar-22	Google	MANDIANT	\$5,357	10.6x

# Significant Cybersecurity Investment Activity

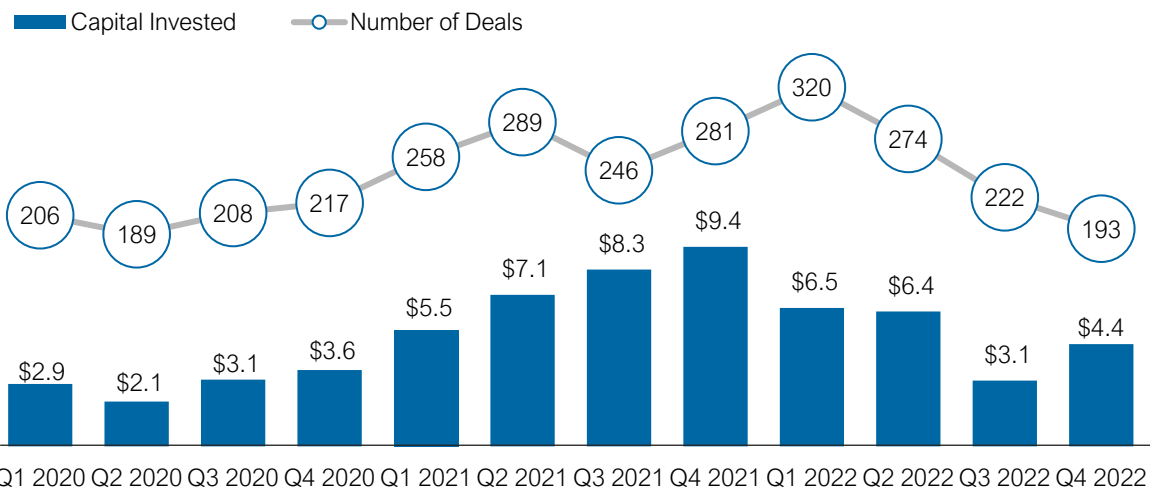
## Annual Financing Summary

(\$ in billions)



## Quarterly Financing Summary

(\$ in billions)



## Select Minority Transactions

(\$ in millions)

Ann. Date	Lead Investor	Target	Amount	Valuation	Total Raised
Dec-22	VECTOR CAPITAL	Malwarebytes	\$100	NA	\$180
Dec-22	QIA QATAR INVESTMENT AUTHORITY	snyk	\$197	\$7,400	\$1,050
Dec-22	ICONIQ	DRATA	\$200	\$2,000	\$328
Nov-22	CARRICK INVESTING MORE THAN CAPITAL	BISHOPFOX	\$129	\$600	\$166
Nov-22	INSIGHT PARTNERS	Island	\$175	\$1,300	\$261
Oct-22	BlackRock	VERSA NETWORKS	\$120	\$800	\$330
Aug-22	PSG PROVIDENCE STRATEGIC GROWTH	bitwarden	\$100	NA	\$100
Jun-22	B Capital Group	perimeter 81	\$100	1,000	\$165
May-22	KKR	semperis	\$208	\$651	\$257
Apr-22	goldman Sachs Asset Management	FORTRESS INFORMATION SECURITY	\$125	NA	\$145
Mar-22	VISTA EQUITY PARTNERS	CRITICALSTART	\$215	NA	\$255
Mar-22	BlueVoyant	LIBERTY	\$250	NA	\$585

# Financial Sponsors Driving Substantial Capital Into Cybersecurity in 2022

## Select Platform/Add-On Acquisitions



## \$100M+ Capital Raises



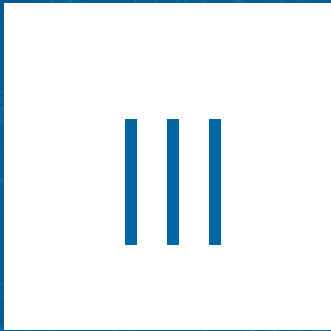
PE-Backed Acquisitions Accounted for \$26B/55%<sup>(1)</sup> of M&A Volume in 2022.

49 Companies Raised \$100M or More in 2022, Totaling \$11.1B.

# Financial Sponsor-Scape: Cybersecurity Portfolio Companies







# Conferences and Events



## Recent Conferences and Events

700+

Industry Leaders and Capital Providers Attended

## Upcoming Conferences and Events

~100

Participating Companies

Targeted

1x1 Meetings

### Participating Cybersecurity Companies



Arete is the leading provider of incident response and managed services, allowing companies to take back control of their systems and restore normal operations

CEO: Joe Mann

Headquarters: U.S.  
www.areteir.com



Bridewell is an industry-leading provider of end-to-end cybersecurity services, including managed security services (MDR) and cyber consultancy

CEOs: Anthony Young, Scott Nicholson

Headquarters: U.K.  
www.bridewellconsulting.com



Index Engines is the industry-leading provider of an analytics engine designed to detect data corruption due to ransomware

CEO: Tim Williams

Headquarters: U.S.  
www.indexengines.com



NowSecure is the leading provider of automated mobile app security and privacy testing software, including professional mobile penetration testing

CEO: Alan Snyder

Headquarters: U.S.  
www.nowsecure.com



Racktop is a leading and innovative provider of Cyberstorage, a primary unstructured data solution that actively defends against ransomware and insider threats

CEO: Eric Bednash

Headquarters: U.S.  
www.racktopsystems.com



Ubisecure is a leading identity platform for customer, citizen, workforce, and organization identity and access management

CEO: Simon Wood

Headquarters: U.K.  
www.ubisecure.com

### Select Conference Attendees



## Recent Conferences and Events

### Cybertech Israel

- Cybertech is one of the cybersecurity industry's leading B2B networking platforms
- The conference and exhibitions serve as the go-to place to make business occur and learn about the latest technological innovations, challenges, solutions, and threats within the cybersphere
- The event features top officials and executives from a wide range of sectors, including critical infrastructure, insurance, retail, health and government, defense, R&D, and more
- Attendees included multinational corporations, startups, private and corporate investors, venture capital firms, experts, and clients

## Upcoming Conferences and Events

### Select Keynote Speakers



Isaac Herzog



Udi Mokady



David Petraeus



Gil Shwed



Noa Asher



Galit Sharon



Yasmin Lukatz



Gaby Portnoy



Vittorio Rizzi



Mohamed Al-Kuwaiti

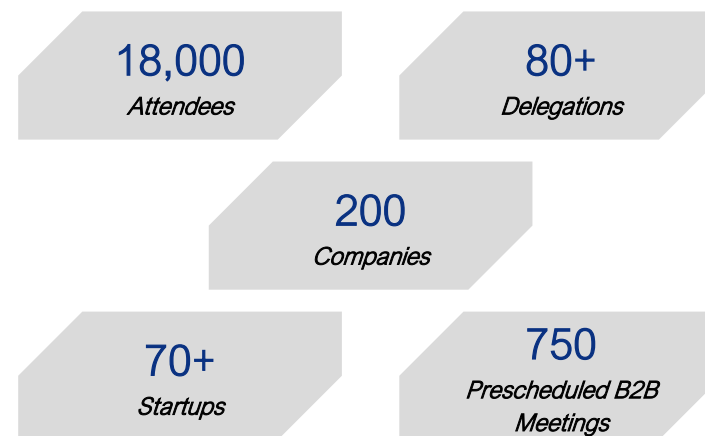


Robert Silvers

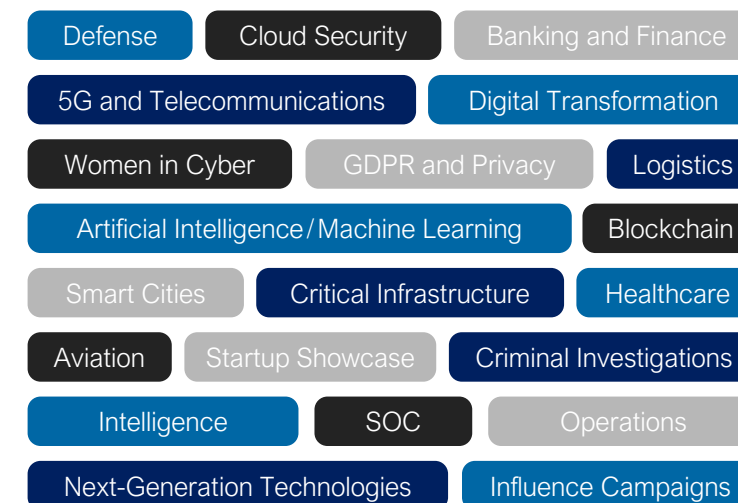


Adi Sharabani

### Key Stats



### Leading the Discussion on Cyber Tech



### Recent Conferences and Events



- RSA Conference (RSAC) is the premier series of global events and year-round learning for the cybersecurity community
- RSAC is the ultimate marketplace for the latest technologies and hands-on educational opportunities that help industry professionals discover how to make their companies more secure while showcasing the most enterprising, influential, and thought-provoking thinkers and leaders in cybersecurity today
- This year's theme is "Stronger Together": a theme to show that none of the breakthroughs in the cybersecurity space could have been achieved without working together, sharing ideas, and examining past failures

### Upcoming Conferences and Events

## Innovation Programs



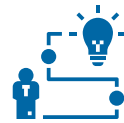
### Innovation Sandbox

Cybersecurity's boldest new innovators compete to put the spotlight on their game-changing ideas



### Launch Pad

Early-stage startups can pitch their new ideas Shark-Tank-style to industry veterans for advice and strategy



### Sandbox

Hosts eight villages for head-to-head interactive activities and games for hands-on experience



### Early-Stage Expo

An opportunity to see up-and-coming companies and the cybersecurity leaders of tomorrow



### Security Scholar

Hand-selected cybersecurity students are able to connect with the RSAC community



### Inclusive Security

Focusing on how changes to cultures and hiring practices can promote a new type of thought within cybersecurity

## Select Keynote Speakers



**Rohit Ghai**  
CEO  
RSA Security



**Tom Gillis**  
Senior Vice President and  
General Manager  
Cisco Security Business Group



**Tanya Janca**  
CEO and Founder  
We Hack Purple



**George Kurtz**  
Co-Founder and CEO  
CrowdStrike



**Mary O'Brien**  
General Manager  
IBM Security



**Dr. Phyllis Schneck**  
Vice President and Chief  
Information Security Officer  
Northrop Grumman



**Kevin Mandia**  
CEO  
Mandiant, Google Cloud



**Lisa Monaco**  
U.S. Deputy Attorney General  
United States Government

## Recent Conferences and Events

- Black Hat is an internationally recognized cybersecurity event series providing the most technical and relevant information security research
- These multi-day events provide the security community with the latest cutting-edge research, developments, and trends
- Attendees can gain hands-on experience and deepen their knowledge through a variety of training opportunities, including beginner- and advanced-level courses

## Upcoming Conferences and Events



## Black Hat USA 2023



The event includes four days of trainings and a two-day main conference featuring Briefings, Black Hat Arsenal, Dark Reading, and more



Black Hat CISO Summit is an approval-only event that brings together top security executives from global corporations and government agencies for a full day of unique discussions



Key topics in the conference include AI and ML, AppSec, Cloud Security, Cryptography, Human Factors, Malware, Mobile Security, Network Security, Policy, and Privacy

## SUSTAINING PARTNERS



## Core Black Hat 2023 Features



### Black Hat Briefings

Provides security professionals with a place to learn the very latest in information security risks, research, and trends



### Black Hat Trainings

Offers individual technical courses with topics ranging from the latest in penetration testing, to exploiting web applications, and defending and building SCADA systems



### Black Hat Certified Pentester

In partnership with The SecOps Group, Black Hat now has its own certification: Black Hat Certified Pentester



### Black Hat Business Hall

Solution providers and startups showcase the latest technologies and security services

The background features a blue-toned image of a hand holding a globe. The globe is overlaid with a white network of lines and dots, suggesting a digital or global theme. On the left side, there are several overlapping circles of varying sizes, some with a light blue glow.

IV

## About Houlihan Lokey



Houlihan Lokey

# Leading Independent, Global Advisory Firm



Houlihan Lokey is the trusted advisor to more top decision-makers than any other independent global investment bank.

<b>2,500+</b> Employees <sup>(1)</sup>	<b>35</b> Locations	<b>\$6.5 Billion</b> Market Cap <sup>(2)</sup>	<b>HLI</b> LISTED NYSE	<b>\$1.8 Billion</b> Annual Revenue <sup>(3)</sup>	<b>~25%</b> Employee-Owned	<b>No</b> Debt
---	------------------------	---	------------------------------	---	-------------------------------	-------------------

### Corporate Finance

- No. 1 Global M&A Advisor Under \$1 Billion
- Leading Capital Markets Advisor Raising More Than \$100 Billion in Past Five Years

Rank	Advisor	Deals
1	Houlihan Lokey	381
2	Rothschild	369
3	JP Morgan	217

Source: Refinitiv.  
Excludes accounting firms and brokers.

### Financial Restructuring

- No. 1 Global Restructuring Advisor
- \$3.0 Trillion of Aggregate Transaction Value Completed

Rank	Advisor	Deals
1	Houlihan Lokey	58
2	PJT Partners	30
3	Lazard	29

Source: Refinitiv.

### Financial and Valuation Advisory

- No. 1 Global M&A Fairness Opinion Advisor Over the Past 25 Years
- 1,000+ Annual Valuation Engagements

Rank	Advisor	Deals
1	Houlihan Lokey	1,232
2	JP Morgan	1,030
3	Duff & Phelps, A Kroll Business	938

Source: Refinitiv.  
Announced or completed transactions.

### Financial Sponsors Coverage

- No. 1 Global Advisor to Private Equity Firms
- 1,000+ Sponsors Covered Globally

Rank	Advisor	Deals
1	Houlihan Lokey	242
2	Lincoln International	192
3	Deloitte	190

Source: PitchBook.

**Houlihan Lokey** + **Oakley Advisory**

Houlihan Lokey has acquired Oakley Advisory, an independent advisory firm that provides a range of services to clients across the digital infrastructure, communications services, and cloud landscape.

With the addition of Oakley, Houlihan Lokey will cover the full spectrum of digital infrastructure and connectivity in the U.S. and Europe.

- Broadband and Connectivity
- Towers and Shared Infrastructure
- Data Centers and Managed Services
- Wireless and Spectrum
- Telecom Services
- Telecom Software

(1) As of December 31, 2022.  
 (2) As of January 2023.  
 (3) LTM ended December 31, 2022.

# Our Tech M&A Team Is No. 1 Globally With Unparalleled Reach

## North America

- Atlanta
- Boston**
- Chicago
- Dallas
- Houston
- Los Angeles**
- Miami**
- Minneapolis
- New York**
- San Francisco**
- Washington, D.C.

## Europe and Middle East

- Amsterdam
- Dubai
- Frankfurt**
- London**
- Madrid
- Manchester**
- Milan**
- Munich
- Paris**
- Stockholm**
- Tel Aviv**
- Zurich

## Asia-Pacific

- Beijing
- Fukuoka
- Gurugram
- Ho Chi Minh City
- Hong Kong SAR
- Mumbai**
- Nagoya
- Osaka
- Shanghai
- Singapore
- Sydney
- Tokyo**

**No. 1**

GLOBAL TECH M&A  
ADVISOR\*

**14**

LOCATIONS  
WORLDWIDE

**235+**

TECHNOLOGY  
BANKERS

**40+**

MANAGING  
DIRECTORS

**115+**

























































TECHNOLOGY  
DEALS IN CY22

**Local Technology Team**

\*Source: Refinitiv. Excludes accounting firms and brokers.



# Deep Cybersecurity Experience Across the Ecosystem

 <p>accelerate your business</p> <p>has received investment from</p>  <p>Sellside Advisor</p>	 <p>a portfolio company of</p>  <p>HoldCo PIK Notes Acquisition Financing</p> <p>Exclusive Placement Agent</p>	 <p>has been acquired by</p>  <p>Sellside Advisor</p>	 <p>has received a growth equity investment of \$70,000,000 from</p>  <p>Financial Advisor</p>	 <p>has made a strategic investment in</p>  <p>Buyside Advisor</p>	 <p>has received a strategic growth investment from</p>  <p>Sellside Advisor*</p>	 <p>has been acquired by</p>  <p>Sellside Advisor*</p>
 <p>has invested in</p>  <p>Financing Advisor*</p>	 <p>has received an investment from</p>  <p>Sellside Advisor*</p>	 <p>has sold a majority stake to</p>  <p>Sellside Advisor*</p>	 <p>has received an equity investment from</p>  <p>Financial Advisor</p>	 <p>has entered into a partnership with</p>  <p>Sellside Advisor*</p>	 <p>has invested in</p>  <p>Buyside Advisor*</p>	 <p>has sold a minority stake to</p>  <p>Sellside Advisor*</p>
 <p>structured equity investment led by</p>  <p>Financing Advisor*</p>	 <p>has been acquired by</p>  <p>Sellside Advisor</p>	 <p>has sold a majority stake in</p>  <p>Sellside Advisor*</p>	 <p>has acquired</p>  <p>Buyside Advisor</p>	<p>Acquisition Financing</p>  <p>has acquired</p>  <p>Financing Advisor*</p>	 <p>has sold substantially all its assets, pursuant to Section 363 of the U.S. Bankruptcy Code, to</p>  <p>Company Advisor</p>	 <p>has been acquired by</p>  <p>Sellside Advisor*</p>
 <p>has been acquired by</p>  <p>Sellside Advisor*</p>	 <p>has been acquired by</p>  <p>Sellside Advisor</p>	 <p>a portfolio company of</p>  <p>Financial Advisor</p>	 <p>has been acquired by</p>  <p>Sellside Advisor*</p>	 <p>has been acquired by</p>  <p>Sellside Advisor*</p>	 <p>has been recapitalized in partnership with</p>  <p>Sellside Advisor</p>	 <p>has been acquired by</p>  <p>Sellside Advisor*</p>

# How Houlihan Lokey Can Help

Our firm is extremely well equipped to help our clients navigate uncertain times. We respond quickly to challenging situations and are constantly helping clients to analyze, structure, negotiate, and execute the best possible solutions from both a strategic and a financial perspective.

## What We Offer

1  **Corporate Finance**


- Mergers and Acquisitions
- Capital Markets
- Private Funds Advisory
- Board Advisory Services

We are widely recognized as a leading M&A advisor to the mid-cap and have long-standing relationships with capital providers, including commercial banks and other senior credit providers, insurance funds, asset managers, and mezzanine fund investors. Few other investment banks maintain the breadth of relationships and capital markets intelligence that we do.

2  **Financial Restructuring**

- Company Advisory
- Special Situations
- Distressed M&A
- Liability Management
- Creditor Advisory

We have the largest restructuring practice of any global investment bank. Since 1988, we have advised on more than 1,500 restructuring transactions (with aggregate debt claims in excess of \$3 trillion). We served as an advisor in 12 of the 15 largest bankruptcies from 2000 to 2022.

3  **Financial and Valuation Advisory**

- Portfolio Valuation and Fund Advisory
- Transaction Opinions
- Corporate Valuation Advisory Services
- Transaction Advisory Services
- Real Estate Valuation and Advisory
- Dispute Resolution Consulting

Over five decades, we have established ourselves as one of the largest financial and valuation advisory firms. Our transaction expertise and leadership in the field of valuation help inspire confidence in the financial executives, boards of directors, special committees, investors, and business owners we serve.

## Why We're Different



No. 1 for U.S. Under \$1 Billion and Tech M&A\*



Significant Experience With Financing Markets



Senior-Level Commitment and Dedication



Deep, Industry-Specific Expertise



Superior Work Product/Technical Abilities



Creativity, Imagination, Tenacity, and Positivity

\*Source: Refinitiv. Excludes accounting firms and brokers.



V




## Appendix



Houlihan Lokey

# High-Growth Cybersecurity Trading Metrics

(\$ in millions)
















Company	Stock Price	52-wk High	% of 52-wk High	Cash & ST Inv	Equity Mkt Cap	Enterprise Value	EV/Revenue			EV/EBITDA		
							CY 2022E	CY 2023E	CY 2024E	CY 2022E	CY 2023E	CY 2024E
 <b>CROWDSTRIKE</b>	\$105.29	\$242.00	43.5%	\$2,467	\$24,703	\$22,982	10.3x	7.7x	5.9x	NM	NM	26.1x
 <b>zscaler</b>	111.90	323.55	34.6%	1,825	16,171	15,532	11.7x	8.9x	7.0x	NM	NM	NM
 <b>SentinelOne</b>	14.59	52.29	27.9%	701	4,124	3,451	8.2x	5.3x	3.7x	NM	NM	NM
<b>Top Quartile</b>					\$20,437	\$19,257	11.0x	8.3x	6.5x	NM	NM	NM
<b>Mean</b>					14,999	13,988	10.1	7.3	5.5	NM	NM	NM
<b>Median</b>					16,171	15,532	10.3	7.7	5.9	NM	NM	NM
<b>1st Quartile</b>					10,148	9,491	9.3	6.5	4.8	NM	NM	NM

Source: Trading multiples are based on share price, other market data, and broker consensus future earnings estimates from S&P Capital IQ as of December 31, 2022.

Note: All financials calendarized to a December year-end. NM indicates not meaningful, not disclosed, or EV/EBITDA >30x or <0x. Financials are valued in \$ millions except for share price. Sorted by Enterprise Value.

# Medium-Growth Cybersecurity Trading Metrics

(\$ in millions)

Company	Stock Price	52-wk High	% of 52-wk High	Cash & ST Inv	Equity Mkt Cap	Enterprise Value	EV/Revenue			EV/EBITDA		
							CY 2022E	CY 2023E	CY 2024E	CY 2022E	CY 2023E	CY 2024E
 paloalto	\$139.54	\$213.63	65.3%	\$3,804	\$42,226	\$42,349	6.9x	5.6x	4.7x	28.1x	22.7x	19.3x
 FORTINET	48.89	72.42	67.5%	2,211	38,333	37,070	8.4x	7.0x	5.8x	29.4x	23.9x	19.8x
 splunk	86.09	150.79	57.1%	1,757	14,093	16,407	4.7x	4.1x	3.4x	NM	22.2x	16.0x
 okta	68.33	226.49	30.2%	2,473	10,945	10,852	5.9x	5.0x	4.2x	NM	NM	NM
 f5	143.51	245.59	58.4%	660	8,628	8,315	3.1x	2.7x	2.6x	9.8x	7.9x	NM
 CYBERARK	129.65	180.01	72.0%	954	5,306	4,894	8.2x	6.7x	5.4x	NM	NM	NM
 tenable	38.15	63.61	60.0%	567	4,336	4,143	6.1x	5.1x	4.2x	NM	NM	25.4x
 Qualys	112.23	162.36	69.1%	321	4,154	3,984	8.1x	7.0x	6.1x	18.4x	17.1x	15.1x
 RAPID7	33.98	118.42	28.7%	291	2,040	2,636	3.9x	3.3x	2.8x	NM	NM	20.1x
 DARKTRACE	3.12	6.76	46.1%	392	2,044	1,746	3.7x	2.8x	2.2x	20.6x	15.9x	11.7x
 ABSOLUTE	10.45	12.71	82.2%	50	550	766	3.4x	3.0x	2.5x	14.3x	13.0x	10.4x
 sumo logic	8.10	13.96	58.0%	322	972	653	2.2x	1.9x	1.6x	NM	NM	NM
 Nitek	9.69	17.85	54.3%	71	433	496	3.3x	2.9x	NM	11.6x	9.8x	NM
 riskified	4.62	8.05	57.4%	476	798	344	1.3x	1.1x	0.9x	NM	NM	NM
 W / T H secure	1.47	6.04	24.3%	74	256	202	1.4x	1.2x	1.1x	NM	NM	NM
<b>Top Quartile</b>					\$9,787	\$9,584	6.5x	5.3x	4.5x	24.3x	22.3x	19.9x
<b>Mean</b>					9,008	8,990	4.7	4.0	3.4	18.9	16.6	17.2
<b>Median</b>					4,154	3,984	3.9	3.3	3.1	18.4	16.5	17.6
<b>1st Quartile</b>					885	709	3.2	2.8	2.3	12.9	12.2	14.2

Source: Trading multiples are based on share price, other market data, and broker consensus future earnings estimates from S&P Capital IQ as of December 31, 2022.

Note: All financials calendarized to a December year-end. NM indicates not meaningful, not disclosed, or EV/EBITDA >30x or <0x. Financials are valued in \$ millions except for share price.

Sorted by Enterprise Value.

# Low-Growth Cybersecurity Trading Metrics

(\$ in millions)

Company	Stock Price	52-wk High	% of 52-wk High	Cash & ST Inv	Equity Mkt Cap	Enterprise Value	EV/Revenue			EV/EBITDA		
							CY 2022E	CY 2023E	CY 2024E	CY 2022E	CY 2023E	CY 2024E
 <b>BROADCOM</b>	\$559.13	\$672.19	83.2%	\$12,416	\$233,716	\$261,215	7.6x	7.4x	7.1x	NM	11.8x	11.2x
 <b>CHECK POINT</b>	126.16	149.62	84.3%	1,638	15,366	14,206	6.1x	5.8x	5.6x	13.4x	12.9x	12.5x
<b>opentext</b>	29.64	48.46	61.2%	2,824	7,920	10,530	3.0x	3.0x	2.9x	8.6x	8.1x	7.8x
 <b>TREND MICRO</b>	46.56	69.38	67.1%	1,842	6,479	4,635	2.7x	2.5x	2.3x	10.6x	9.9x	9.2x
 <b>solarwinds</b>	9.36	14.75	63.5%	149	1,516	2,641	3.7x	3.6x	3.4x	9.6x	8.8x	8.0x
 <b>BlackBerry</b>	3.26	8.90	36.6%	449	1,891	1,916	2.8x	2.8x	2.5x	NM	NM	NM
 <b>F-Secure</b>	3.02	3.48	86.9%	25	528	511	4.3x	4.1x	3.9x	11.3x	10.7x	9.4x
<b>Secureworks</b>	6.39	17.20	37.2%	139	541	415	0.9x	1.0x	0.9x	NM	NM	NM
 <b>OneSpan</b> <small>The Digital Agreements Company</small>	11.19	17.79	62.9%	99	448	356	1.6x	1.6x	1.5x	NM	NM	NM
 <b>Telos</b>	5.09	16.15	31.5%	125	342	231	1.1x	1.2x	1.2x	15.3x	NM	15.3x

<b>Top Quartile</b>	\$7,560	\$9,057	4.2x	4.0x	3.8x	12.9x	11.5x	11.8x
<b>Mean</b>	26,875	29,666	3.4	3.3	3.1	11.5	10.4	10.5
<b>Median</b>	1,704	2,278	2.9	2.9	2.7	11.0	10.3	9.4
<b>1st Quartile</b>	531	439	1.9	1.8	1.7	9.9	9.1	8.6




Source: Trading multiples are based on share price, other market data, and broker consensus future earnings estimates from S&P Capital IQ as of December 31, 2022.

Note: All financials calendarized to a December year-end. NM indicates not meaningful, not disclosed, or EV/EBITDA >30x or <0x. Financials are valued in \$ millions except for share price.

Sorted by Enterprise Value.

# High-Growth Cybersecurity Operating Metrics

(\$ in millions)

Company	Stock Price	Equity Mkt Cap	Enterprise Value	Revenue			EBITDA			Revenue Growth			EBITDA Margin		
				CY 2022E	CY 2023E	CY 2024E	CY 2022E	CY 2023E	CY 2024E	2021-2022E	2022-2023E	2023-2024E	CY 2022E	CY 2023E	CY 2024E
 <b>CrowdStrike</b>	\$105.29	\$24,703	\$22,982	\$2,231	\$2,979	\$3,891	\$439	\$601	\$880	53.7%	33.5%	30.6%	19.7%	20.2%	22.6%
 <b>Zscaler</b>	111.90	16,137	15,532	1,326	1,740	2,221	196	283	411	54.2%	31.2%	27.6%	14.8%	16.2%	18.5%
 <b>SentinelOne</b>	14.59	4,124	3,451	420	652	944	(200)	(139)	(8)	105.1%	55.2%	44.7%	NM	NM	NM
<b>Top Quartile</b>		\$20,420	\$19,257	\$1,778	\$2,359	\$3,056	\$317	\$442	\$645	79.7%	44.4%	37.6%	18.4%	19.2%	21.6%
<b>Mean</b>		14,988	13,988	1,326	1,790	2,352	145	248	428	71.0%	40.0%	34.3%	14.8%	18.2%	20.6%
<b>Median</b>		16,137	15,532	1,326	1,740	2,221	196	283	411	54.2%	33.5%	30.6%	18.4%	18.2%	20.6%
<b>1st Quartile</b>		10,131	9,491	873	1,196	1,582	(2)	72	202	54.0%	32.4%	29.1%	17.5%	17.2%	19.5%

Source: Trading multiples are based on share price, other market data, and broker consensus future earnings estimates from S&P Capital IQ as of December 31, 2022.  
 Note: All financials calendarized to a December year-end. NM indicates not meaningful or not disclosed. Financials are valued in \$ millions except for share price.  
 Sorted by Enterprise Value.

# Medium-Growth Cybersecurity Operating Metrics

(\$ in millions)

Company	Stock Price	Equity Mkt Cap	Enterprise Value	Revenue			EBITDA			Revenue Growth			EBITDA Margin		
				CY 2022E	CY 2023E	CY 2024E	CY 2022E	CY 2023E	CY 2024E	2021-2022E	2022-2023E	2023-2024E	CY 2022E	CY 2023E	CY 2024E
paloalto	\$139.54	\$42,183	\$42,349	\$6,149	\$7,618	\$9,105	\$1,506	\$1,869	\$2,191	26.6%	23.9%	19.5%	24.5%	24.5%	24.1%
FORTINET	48.89	38,207	37,454	4,430	5,373	6,422	1,262	1,549	1,872	32.6%	21.3%	19.5%	28.5%	28.8%	29.2%
splunk	86.09	14,093	16,407	3,475	4,031	4,772	544	738	1,028	30.0%	16.0%	18.4%	15.7%	18.3%	21.5%
okta	68.33	10,945	10,852	1,838	2,172	2,587	(12)	83	195	41.3%	18.2%	19.1%	NM	3.8%	7.5%
CYBERARK	143.51	8,628	8,315	2,708	3,024	3,185	846	1,047	NA	1.6%	11.7%	5.3%	31.2%	34.6%	NM
tenable	129.65	5,306	4,894	597	728	899	(5)	20	82	18.7%	22.0%	23.4%	NM	2.7%	9.1%
Qualys	38.15	4,313	4,145	680	817	978	83	108	163	25.7%	20.2%	19.7%	12.2%	13.2%	16.7%
RAPID7	112.23	4,240	3,984	489	567	649	217	234	264	18.9%	16.0%	14.5%	44.4%	41.2%	40.7%
DARKTRACE	33.98	2,016	2,636	680	795	948	44	63	131	27.1%	16.8%	19.3%	6.5%	8.0%	13.8%
ABSOLUTE	3.12	2,044	1,746	478	618	794	85	110	150	37.6%	29.2%	28.5%	17.8%	17.7%	18.9%
sumo logic	10.45	550	766	222	259	306	54	59	74	43.0%	16.8%	18.0%	24.1%	22.7%	24.0%
Nitek	8.10	972	653	298	349	398	(32)	(31)	(20)	23.3%	16.8%	14.2%	NM	NM	NM
riskified	9.69	433	496	151	174	NA	43	51	NA	19.7%	15.2%	NA	28.4%	29.2%	NM
W / T H secure	4.62	782	339	259	306	375	(45)	(32)	(13)	13.1%	17.9%	22.8%	NM	NM	NM
<b>Top Quartile</b>		\$9,787	\$9,584	\$2,273	\$2,598	\$3,035	\$380	\$486	\$264	31.3%	20.7%	19.6%	28.5%	28.9%	24.1%
<b>Mean</b>		8,998	9,016	1,507	1,800	2,257	304	390	471	20.9%	18.4%	18.2%	23.3%	20.4%	18.8%
<b>Median</b>		4,240	3,984	597	728	923	54	83	150	25.7%	16.8%	19.2%	24.3%	20.5%	18.9%
<b>1st Quartile</b>		877	709	279	327	461	(9)	35	74	18.8%	16.0%	15.4%	16.2%	11.9%	11.5%

Source: Trading multiples are based on share price, other market data, and broker consensus future earnings estimates from S&P Capital IQ as of December 31, 2022.  
 Note: All financials calendarized to a December year-end. NM indicates not meaningful or not disclosed. Financials are valued in \$ millions except for share price.  
 Sorted by Enterprise Value.



# Low-Growth Cybersecurity Operating Metrics

(\$ in millions)

Company	Stock Price	Equity Mkt Cap	Enterprise Value	Revenue			EBITDA			Revenue Growth			EBITDA Margin		
				CY 2022E	CY 2023E	CY 2024E	CY 2022E	CY 2023E	CY 2024E	2021-2022E	2022-2023E	2023-2024E	CY 2022E	CY 2023E	CY 2024E
BROADCOM	\$559.13	\$233,653	\$261,215	\$34,399	\$35,282	\$36,707	\$21,775	\$22,212	\$23,298	20.7%	2.6%	4.0%	63.3%	63.0%	63.5%
CHECK POINT	126.16	15,366	14,206	2,328	2,445	2,546	1,059	1,098	1,138	7.4%	5.0%	4.1%	45.5%	44.9%	44.7%
opentext	29.64	7,920	10,530	3,514	3,516	3,637	1,226	1,305	1,357	2.3%	0.1%	3.5%	34.9%	37.1%	37.3%
TREND MICRO	46.56	6,479	4,635	1,689	1,850	1,984	435	467	503	2.1%	9.6%	7.2%	25.8%	25.2%	25.3%
solarwinds	9.36	1,516	2,641	713	736	785	275	299	328	(0.8%)	3.2%	6.6%	38.6%	40.6%	41.9%
BlackBerry	3.26	1,891	1,916	688	673	752	(46)	(67)	(21)	(7.4%)	(2.2%)	11.8%	NM	NM	NM
F-Secure	3.02	528	511	119	124	130	45	48	54	(55.8%)	4.3%	5.2%	38.2%	38.5%	41.5%
Secureworks	6.39	541	415	457	436	468	(62)	(76)	(58)	(14.6%)	(4.6%)	7.4%	NM	NM	NM
OneSpan <small>The Digital Agreement Company</small>	11.19	444	361	216	229	241	2	1	2	0.6%	6.3%	5.2%	0.7%	0.6%	0.7%
Telos	5.09	342	231	214	186	198	15	6	15	(11.6%)	(13.4%)	6.9%	7.0%	3.4%	7.6%

<b>Top Quartile</b>	\$7,560	\$9,057	\$2,168	\$2,297	\$2,405	\$903	\$940	\$979	2.2%	4.9%	7.1%	40.4%	41.7%	42.6%
<b>Mean</b>	26,868	29,666	4,434	4,548	4,745	2,473	2,529	2,662	(5.7%)	1.1%	6.2%	31.8%	31.7%	32.8%
<b>Median</b>	1,703	2,278	700	704	768	160	173	191	(0.1%)	2.9%	5.9%	36.6%	37.8%	39.4%
<b>1st Quartile</b>	531	439	276	281	298	5	3	5	(10.6%)	(1.6%)	4.4%	21.1%	19.8%	20.9%

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