

BDA | The Bond Buyer
National Muni Bond Conference
March 25-27
Nashville

Panel on Cybersecurity

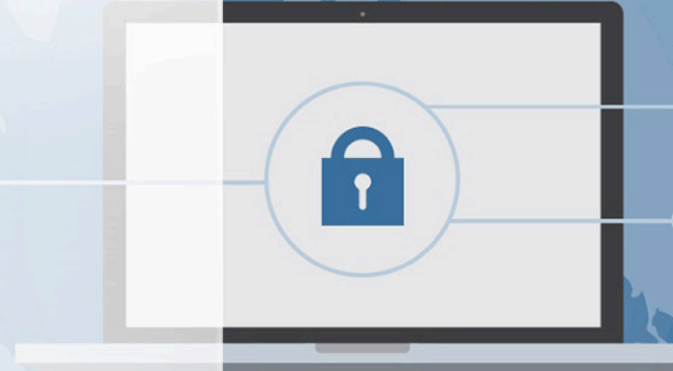
March 27, 2019

9:30-10:30

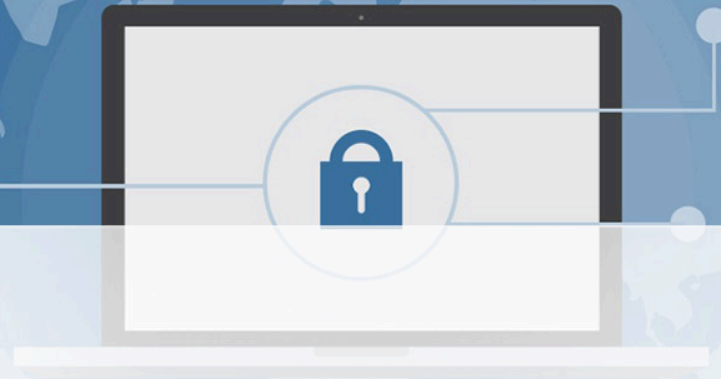
Jeff Peelen
Quarles & Brady LLP
Moderator

Panelists

- Jeff Peelen – Quarles & Brady LLP (moderator)
- Joe Kirst – Court Street Group
- Orlie Prince – Moody's
- Jon Savage – Armolon Corp.
- Tiffany Tribbitt – S&P Global

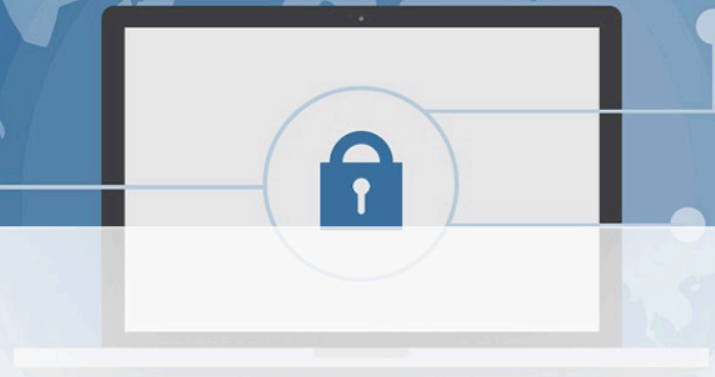


Roadmap



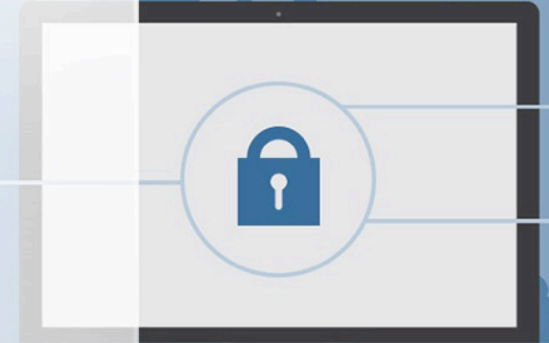
- 3 Areas of Concern:
 - Cybersecurity threats to BDs and issuers/borrowers
 - Effects on issuer/borrower credit profiles
 - Legal responsibilities (regulatory, disclosure obligations)

Cybersecurity



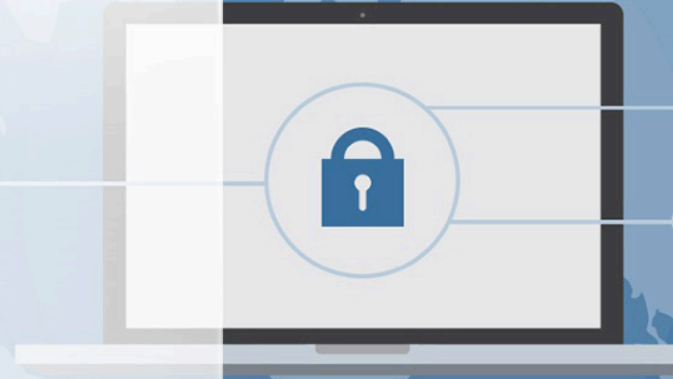
Cybersecurity Threats

Cybersecurity Threats

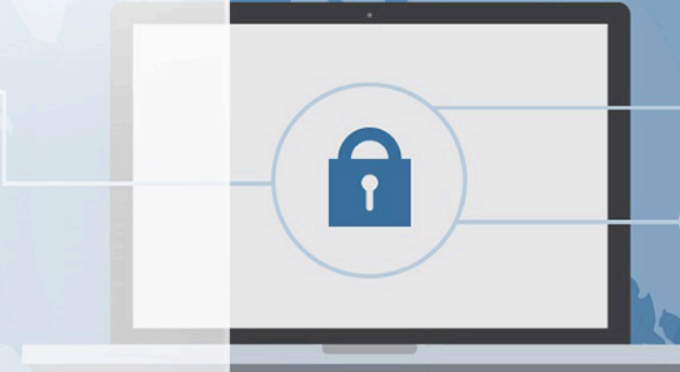


Cybersecurity Threats

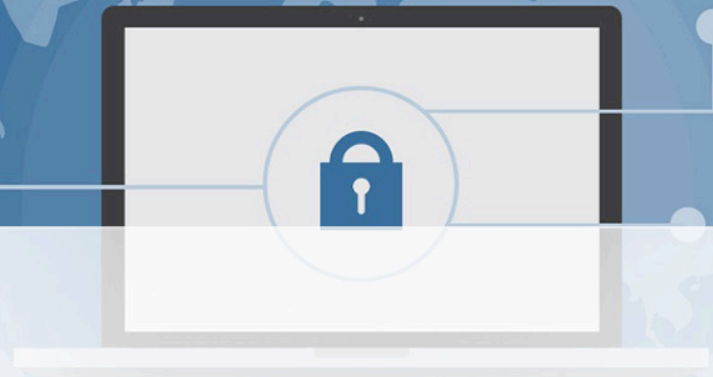
- Two Broad Types of Cybercrime
 - Goal: disable the target computer system
 - Goal: access data and administrative privileges
- Types of Threats, on the Rise
 - Malware
 - Phishing
 - Distributed Denial of Service (DDOS)
 - "Man in the Middle"
 - Cryptojacking – "Mining" using another's computer
 - SQL Injection
 - Zero-day exploits
 - Mobile phone | unofficial third-party app stores
- Recent Attacks
 - WannaCry
 - NotPetya
 - Ethereum
 - Equifax, Yahoo



Example - SQL Injection



Cybersecurity



Effects on Credit Profiles

Cybersecurity & Assessing Credit Risk – Moody's

1

We view cyber risk as event risk and see a rising tide; digitization, greater intersection of supply chains, connectivity and access to data are creating new vulnerabilities for governments and businesses

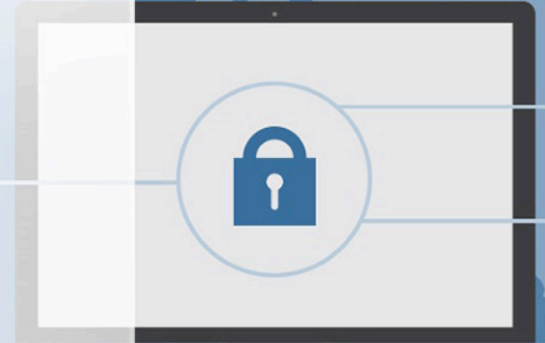
2

Our assessments consider the financial impact of an attack that could lead to weakened credit profile; these primarily derive from reputational impacts and/or disruption of core business processes

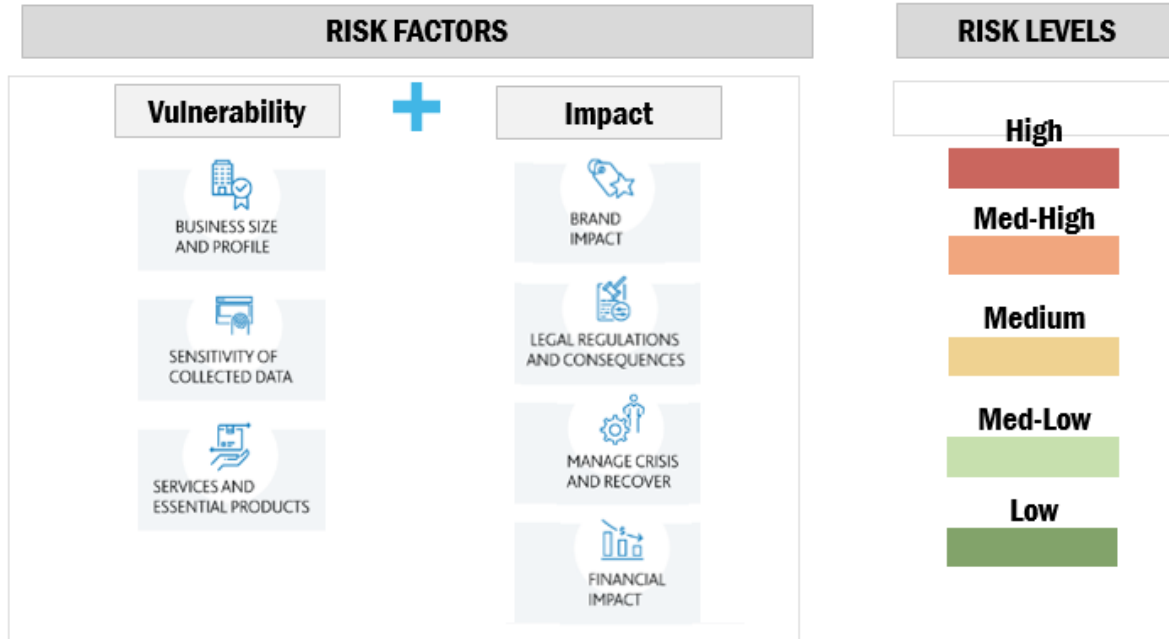
3

13 sectors assessed as high or medium-high risk; common attributes include significant reliance on technology / data; limited ability to fall back on manual processes; represent critical global infrastructure

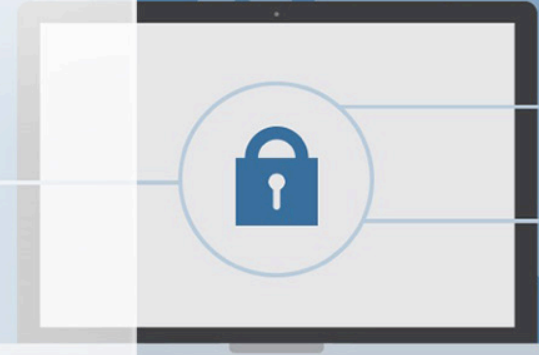
Source: Moody's Investors Service



Cybersecurity & Assessing Credit Risk – Moody's

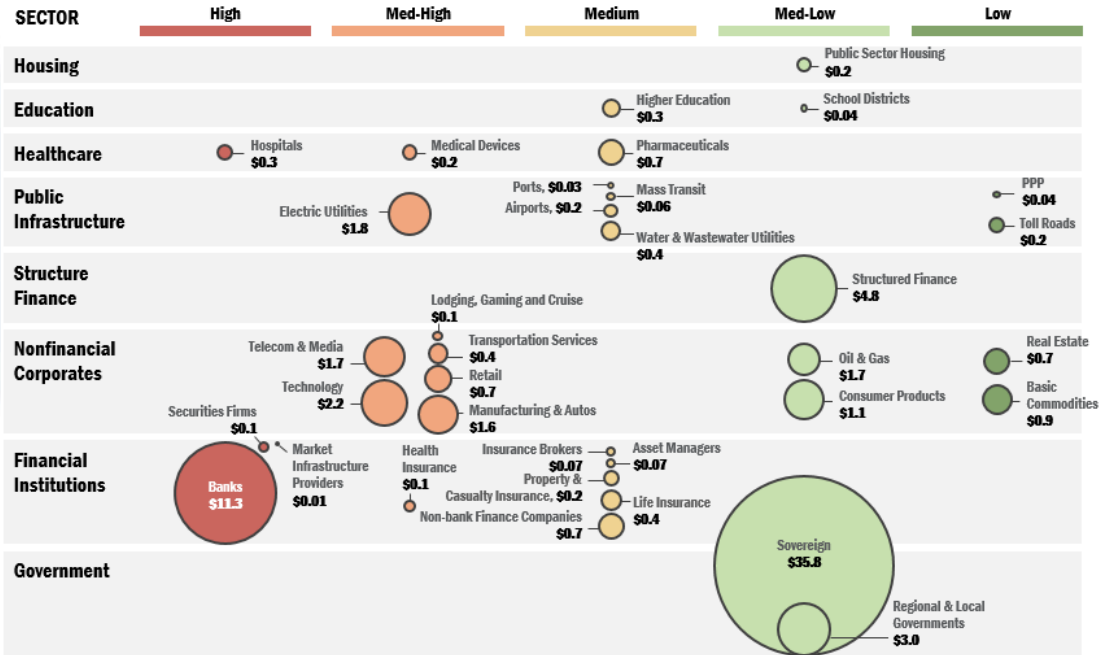


Source: Moody's Investors Service



Cybersecurity & Assessing Credit Risk – Moody's

Cyber risk levels and Moody's-rated debt



Source: Moody's Investors Service

Cybersecurity & Assessing Credit Risk – Moody's

Sector	Vulnerability	Impact	Overall	Rated Debt (in \$ billions)
Hospitals	HIGH	HIGH	HIGH	250
Electric Utilities*	HIGH	MEDIUM	MEDIUM-HIGH	1,824
Higher Education	HIGH	LOW	MEDIUM	310
Airports	MEDIUM	MEDIUM	MEDIUM	174
Ports	MEDIUM	MEDIUM	MEDIUM	28
Mass Transit	MEDIUM	MEDIUM	MEDIUM	58
Water and Waste Water Util.*	MEDIUM	MEDIUM	MEDIUM	375
Regional and Local Gvt	MEDIUM	MEDIUM	MEDIUM-LOW	3,008
School District	MEDIUM	LOW	MEDIUM-LOW	41
Toll Roads	LOW	LOW	LOW	217
PPP	LOW	LOW	LOW	41

Source: Moody's Investors Service



Cybersecurity & Assessing Credit Risk – S&P

Cyber Data Triad

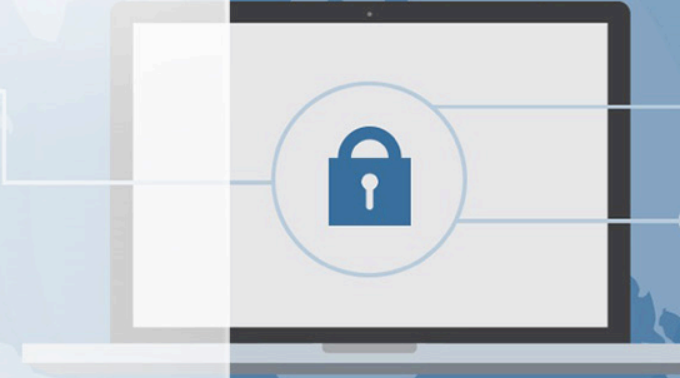
- Confidentiality
- Integrity
- Availability

Frequent Attacks

- Phishing
- DDoS
- Ransomware
- Hacktivism

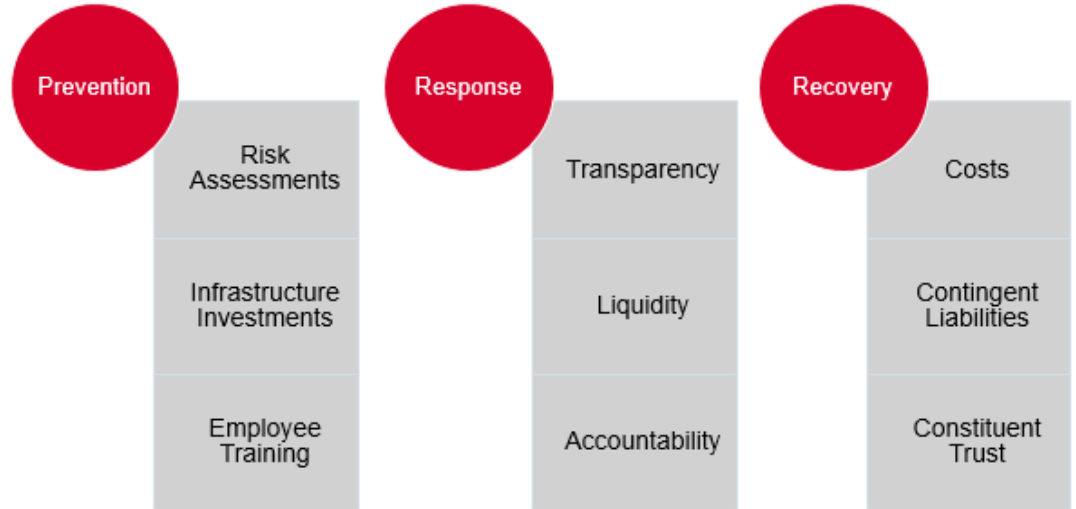
Recent Examples

- Atlanta, GA
- Princeton Community Hospital, WV
- Southern Oregon University
- Lansing Board of Water and Power, MI
- New Hampshire Retirement System



Cybersecurity & Assessing Credit Risk – S&P

Immediate liquidity risk – Long-term credit risk



Cybersecurity & Assessing Credit Risk – S&P

Questions for Issuers

These are meant to start a discussion and help S&P Global gauge management preparedness. Should we find that an event has occurred, follow-up questions will be needed.

Where do you see your greatest exposure to cyber risks?	What type of planning have you done for cyber mitigation or cyber response?	What impact has cyber security had on liquidity?
An open question to get info on management preparedness	A question to gauge actions taken to date	A question to see if issuers spent money on preparation or on ransom



Cybersecurity & Assessing Credit Risk – S&P

Atlanta's March 22, 2018 Cyber Attack

A brief case study

Response

- Employees computers shut down until March 27
- Consultants brought in to help with response and recovery
- \$7 million in direct costs associated with the attack

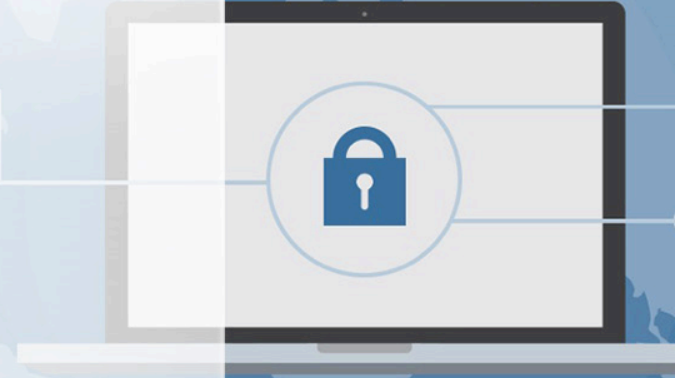
Recovery

- Insurance reimbursement expected
- Loss of archived police camera footage
- Citizens unable to pay bills or apply/renew business licenses
- Certain online systems down until June

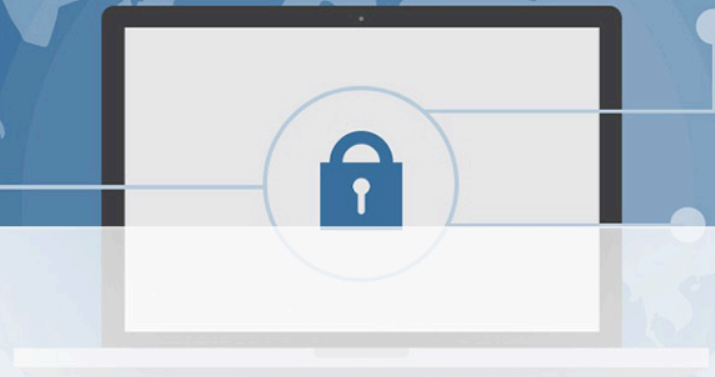
Prevention

- Investments made to upgrade systems to prevent future attacks

S&P Global
Ratings

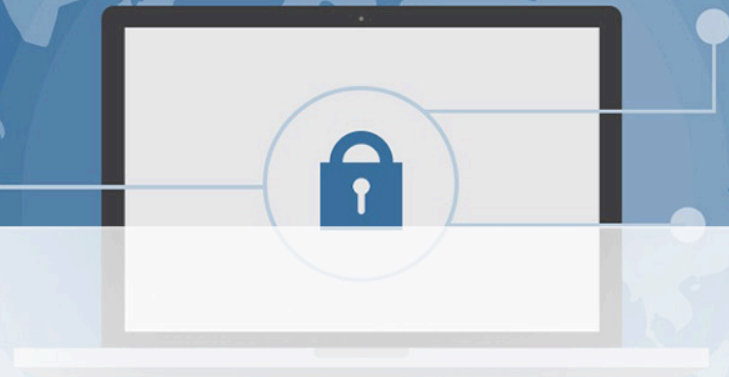


Cybersecurity



Legal Responsibilities

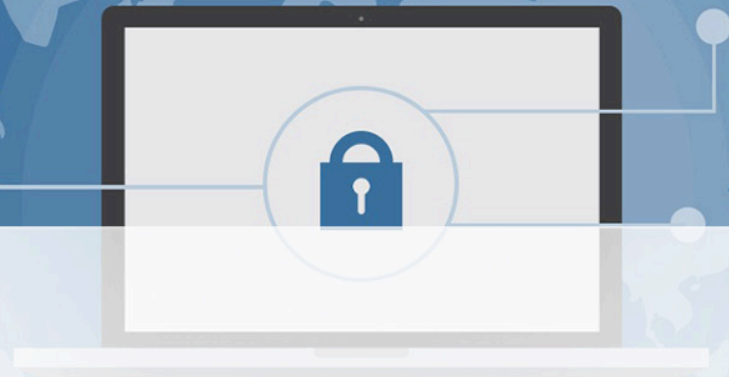
Cybersecurity



Securities Law

- Due Diligence
- Offering Document Disclosure

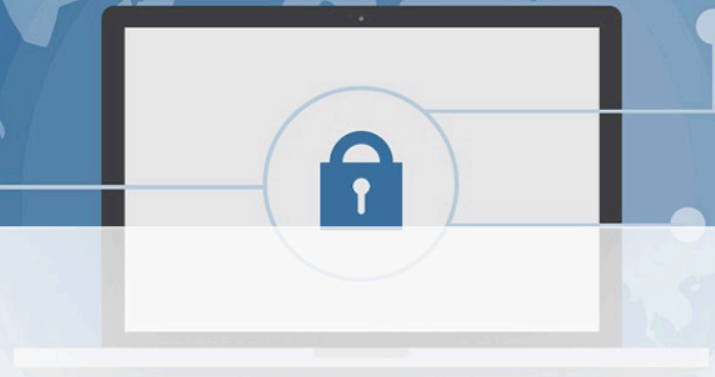
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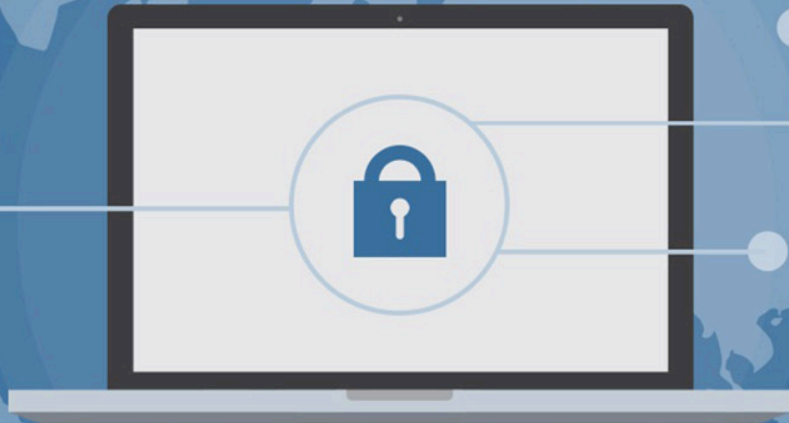
Regulatory

- FINRA 2018 Update
- SEC Cybersecurity 2 Initiative

Cybersecurity



Discussion and Questions



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