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Standing together for financial industry
cyber resilience
Quantum Dawn 3 after-action report

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Background

In November of 2011 and July of 2013, the Securities Industry and Financial Markets Association (SIFMA), in conjunction with Norwich University Applied Research Institutes (NUARI), coordinated two cybersecurity exercises for the financial services sector (Sector) called Quantum Dawn 1 and Quantum Dawn 2, respectively. These wide-scale simulations provided a forum for participants to exercise risk practice responses to a systemic cyberattack. On September 16th 2015, SIFMA hosted Quantum Dawn 3 (QD3), the third cyber simulation in the series. It included over 650 participants from over 80 financial institutions, government agencies and market utilities.

QD3 was designed with a focus to improve the readiness of the Sector to respond to Sector-wide cyberattacks. The exercise allowed firms to rehearse response mechanisms, both internally across departments and externally across the Sector, against a broad range of attacks, as well as to simulate public and private sector market-wide communications, information sharing, threat monitoring, and decision-making during a systemic cyber-attack.

Deloitte Advisory observed the simulation and assisted in the preparation of this after-action report containing recommendations aimed to further protect the nation's critical financial services infrastructure. This report focuses on the industry's overall response to cyber-attacks (e.g., communication and escalation, decision-making, government interactions, financial sector process implications) and provides high-level observations that individual market participants should consider to better respond to cyber incidents.

Exercise objectives

Goals of the exercise, as defined by SIFMA, are as follows:

1

Simulate the degradation of critical infrastructure by effecting the timeliness and /or accuracy (integrity) of the clearance and settlement process for equities, allowing participants to exercise their coordination to remediate or resolve the situation.

2

Rehearse firms' internal response capabilities to a cyber-attack scenario, which requires coordination of business continuity, operations and information security practices in order to maintain equity operations.

3

Exercise the interaction between the firms and the public sector (e.g., government agencies, regulators) with a focus on sharing information or requesting assistance.

4

Facilitate crisis-state information sharing using only real world communication paths [e.g., phone, email, Financial Services Information Sharing and Analysis Center (FS-ISAC) portal].

5

Exercise the Financial Services Sector Coordinating Council (FSSCC)/FS-ISAC All Hazards Playbook and the Financial Sector Cyber Response Coordination Guide (FSCRCG) so that firms understand what coordination will occur at a Sector level during a systemic crisis situation.

QD3 cyber-attack scenario

The scenario, designed by NUARI, was a one-day exercise which featured several different attacks that participants faced over a simulated three-business-day timeline. The scenarios were built on lessons learned from past exercises and with thoughtful input from industry specialists.

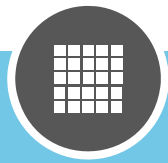
Participants first experienced a set of individual firm-level attacks, such as a distributed denial of service (DDoS), a domain name system (DNS) poisoning or breach of personally identifiable information (PII) that prevented them from conducting business normally. These attacks allowed participants to rehearse their response playbooks and plans.

The next set of attacks caused market-wide disruption by affecting equity exchanges, alternative trading systems, and the overnight settlement process. These attacks forced the market participants to work in collaboration with each other and government agencies and regulators to address the incident at hand.

QD3 stands out from previous Quantum Dawn exercises by:



Allowing firms to rehearse their internal response and recovery practices against a diverse set of threats








Highlighting dependencies on critical market utilities and infrastructure



Providing opportunities for firms to engage and interact with law enforcement

Cyber-attack scenario (contd.)

The five cyberattacks the participating organizations worked through are summarized below. No organization received all four of the firm-specific attacks.

Attack Name				
Domain Name System (DNS) Attack 	Distributed Denial of Service (DDoS) 	Insider PII Breach 	Loss of Availability 	Settlement System Compromise (Malware) 
<ul style="list-style-type: none"> The firm's website traffic redirected to a bogus website through manipulated router settings. Customers that attempted to access the affected websites during this time may have had their login credentials compromised and/or may have been targeted with malicious software. 	<ul style="list-style-type: none"> Attackers threatened to launch a DDoS attack if banks failed to pay a internet Bitcoin ransom within two hours. After the stated time elapsed, the attacker conducted a small scale and relatively short "demonstration" attack that caused minor disruption to the customer website. The group asserted that it has the capability to launch more powerful and sustained attacks and demanded that firms pay a larger ransom. 	<ul style="list-style-type: none"> An insider gained unauthorized access to account information of key clients and posted additional client data in exchange for Bitcoin Internet currency. FBI reported that this was a data breach and a patch was issued which needed to be applied to repair functionality. If unaffected firms were informed about the need to patch, they could prevent data breaches at their firm. 	<ul style="list-style-type: none"> Firms lost availability/connection to major trade processing provider or custodian. An insider compromised the exchange router to disrupt order processing between self clearing firms and the exchanges. 	<ul style="list-style-type: none"> An insider introduced malware into clearing systems leading to transaction failures. Malware was initiated after close-of-day summary and settlement reports, so that all data will appear correct going into Continuous Net Settlement (CNS) Evening Cycle. Malware caused major settlement failures (80 – 90%) and increased risk and uncertainty to all parties. Media released reports to the public, with many errors in the details.
Attack Summary				
			Firm-Specific Attacks	Pervasive Industry-Wide Attack

QD3 benefited the industry

QD3 demonstrated many positive behaviors and continued to raise awareness among industry participants. The Sector should continue to build on these results and successes:

- ✓ Institutions were able to evaluate internal and external capabilities in responding to the market-wide cyberattacks.
- ✓ More than 80 organizations built muscle memory within their crisis response by exercising DDoS mitigation, DNS attack coordination, and data breach assessment and communication. All respondents to the post-simulation survey indicated their organization felt more prepared after the exercise than before.
- ✓ Institutions, along with the FS-ISAC, the FBI, and regulators, enhanced their working relationships and exercised the public/private collaboration that will be required to respond to a large-scale attack.
- ✓ The FS-ISAC and FBI specifically indicated that they were appropriately engaged by organizations and were active participants in information sharing during the exercise.
- ✓ The exercise demonstrated the critical importance of information sharing in responding to a cyberattack and the value of having established and regularly utilized processes prior to a crisis.

Recommendations

While the exercise yielded many positive results, it also identified opportunities to improve response protocols and strengthen coordination among the industry participants.

Theme	Recommendations
<p>Individual Firm Preparedness</p>	<p>Internal response capabilities during a cyber-attack</p> <ul style="list-style-type: none"> • Enhance executive leadership involvement in the response, recovery, and decision making protocols during times of crisis. Firms should create integrated cyber incident response teams consisting of representatives from internal information security, technology, business functions, and required third parties to support a robust response and recovery strategy. • Enhance their internal playbooks to prepare for an expanded array of attacks, including development of additional scenario-based playbooks that account for these various types of attacks or threat vectors.
<p>Sector Preparedness</p>	<p>Market wide communication, monitoring, and decisions-making</p> <ul style="list-style-type: none"> • Enhance the role of market utilities to aid the early detection of, and response to, a systemic crisis. • Develop additional (or augment existing) Sector playbooks to cover Sector-wide events affecting market utilities. <p>Interactions between firms and the public sector (e.g., government agencies, regulators, law enforcement)</p> <ul style="list-style-type: none"> • Strengthen communication with regulators and government agencies, and raise awareness concerning government resources and capabilities available to assist the Sector. • Promote information sharing standards and processes to allow market participants to share various cyberattack data, such as threat actors, common vulnerabilities, and mitigation strategies. • Establish criteria and thresholds jointly between the private sector, government agencies and regulators, that will be used to trigger contact and action between them.

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- Industry groups – Securities Industry and Financial Markets Association (SIFMA); Financial Services – Information Sharing and Analysis Center (FS-ISAC); Financial Services Sector Coordinating Council (FSSCC); Financial and Banking Information Infrastructure Committee (FBIIC)
- QD3 was designed by Norwich University Applied Research Institutes (NUARI) and hosted by SIFMA

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