SNIA NSF | NETWORKING STORAGE

Storage Networking Security Series: Protecting “Data at Rest”

Live Webcast

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10:00 am PT

Today's Presenters

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- NVMe-oF
- InfiniBand
- Fibre Channel, FCoE
- Hyperconverged (HCI)
- Storage protocols (block, file, object)
- Virtualized storage
- Software-defined storage

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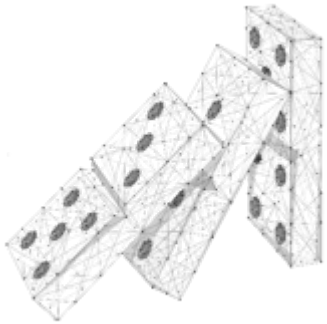
Agenda

- Security in a complex world
- Why security for Data-at-rest
- Data-at-rest vs. Data-in-flight
- Key Management
- Ransomware
- Importance of validating data backups
- Q&A

Security in a Complex World

What are the Basic Threats to Data at Rest?

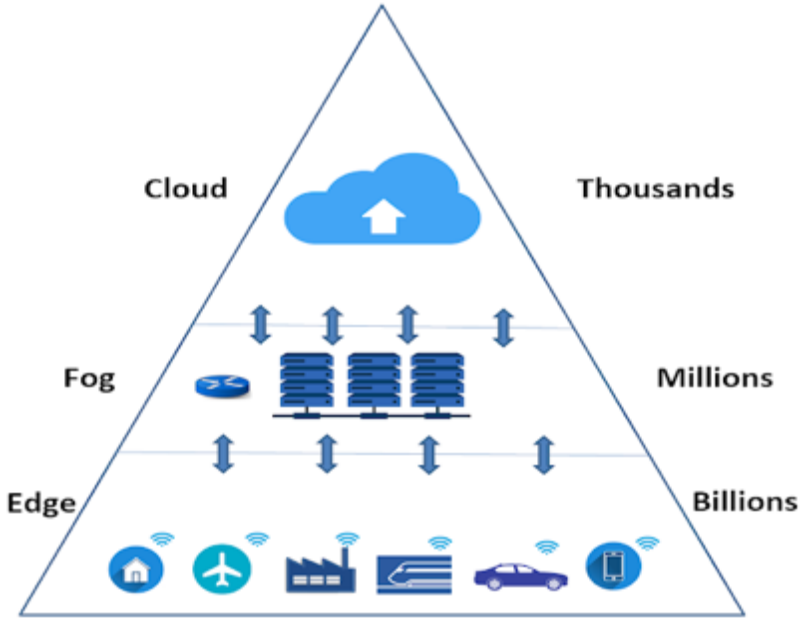
- Lost
  - Equipment failure, Human error
  - Natural disaster
- Compliance problems
  - Access, retention
  - Storage method/location
- Stolen
- Held for ransom



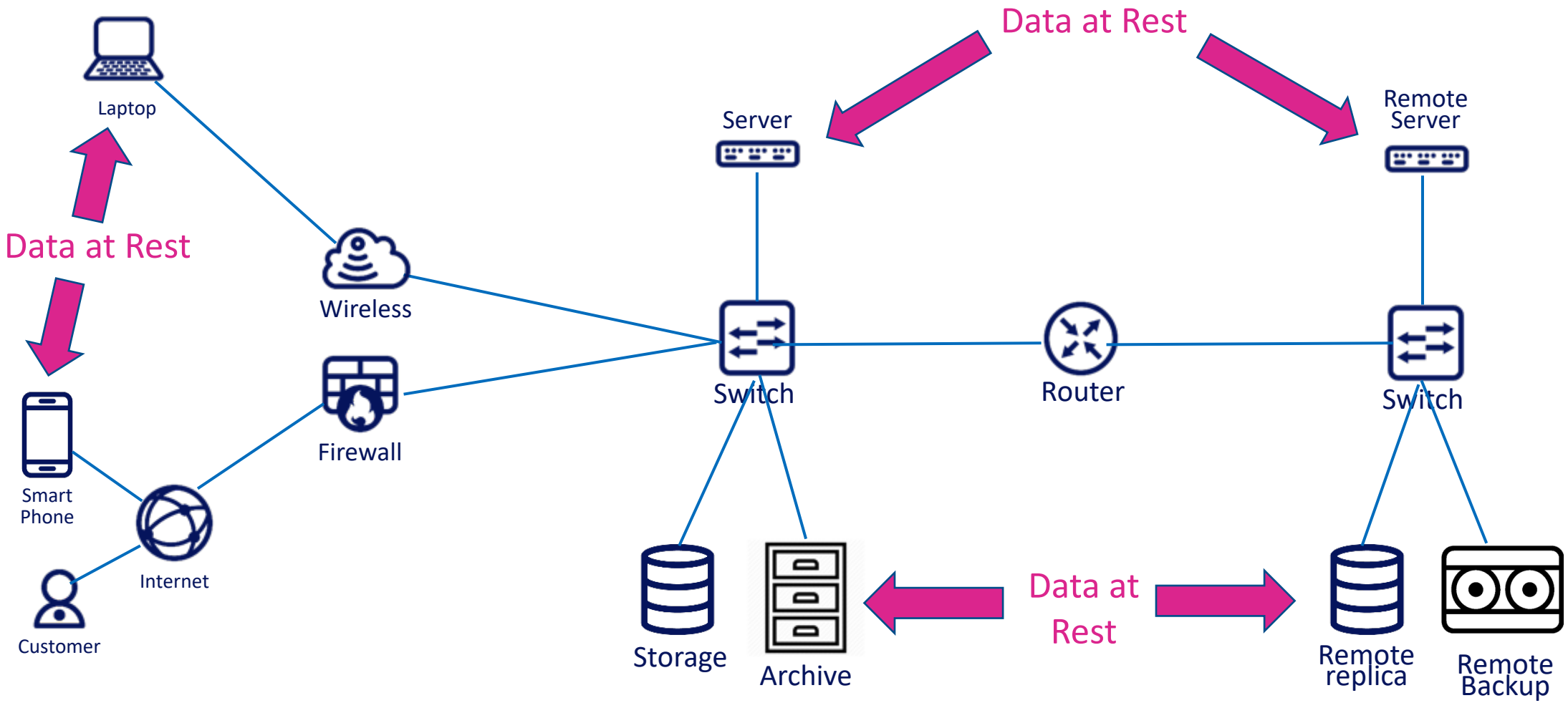
Data in a Complex World

- It's common to miscalculate the threats
  - Where is the data stored?
- Data stored in personal computer limit the threats calculated to one device
- Data stored in the cloud move between thousands of devices

PC

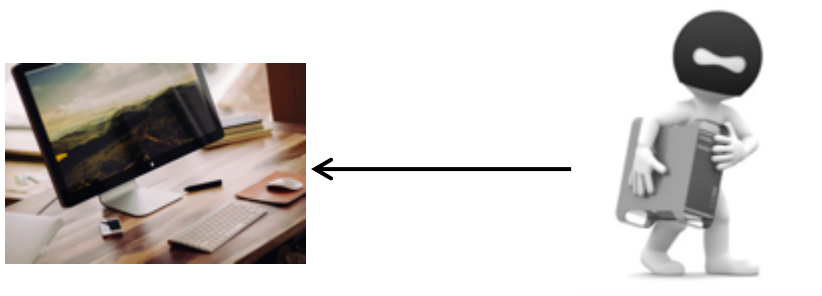


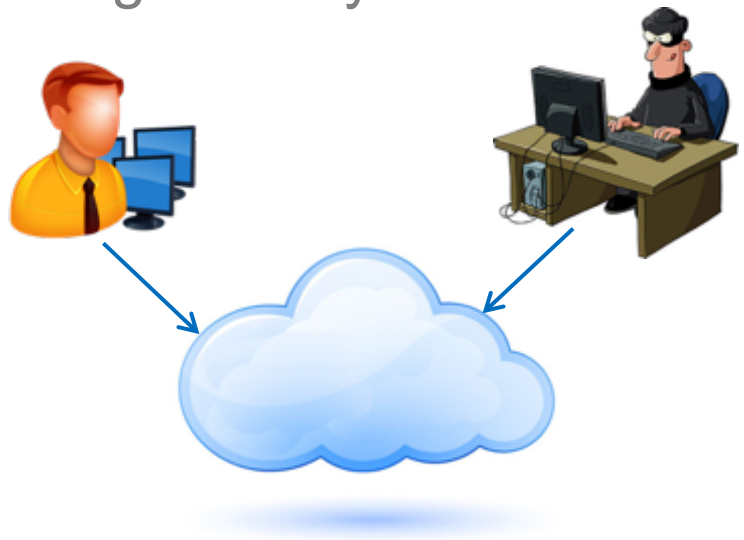
Typical Data-at-Rest Locations



Protecting Data-At-Rest, why?

- It's easy to remember the data accessed daily
  - Anti-virus, firewalls are the typical security controls involved in protecting data
    - How is the data protected when the anti-virus license expire in 3 years?
- it's easy to forget about data we do not use
  - What about data and archives stored that haven't thought of in years?
  - Who has access to your data ?





Compliance

Data-at-rest vs. Data-in-flight

- Cryptography was initially created to protect data-in-motion
- Data-in-flight rely on session keys that are short lived while Data-at-rest rely on storage keys that live for a long time
  - Which type of keys has a higher risk of exposure?
- Storing storage keys is as important as the data being stored
  - The golden solution is to store a key in someone's brain and make her immune to physical and emotional attacks
  - What is the lifetime of a storage key?

Data-at-rest vs. Data-in-flight

- Limiting the use of storage keys to reduce the risk of leakage is not practical or sufficient
  - Protecting access control is as important as protecting the keys
    - Does the key length matter for an attacker?
- It's sufficient for an attacker to hack into the system to get hold of a key once
  - We cannot rely on communication security to solve our system security problems

Key Management

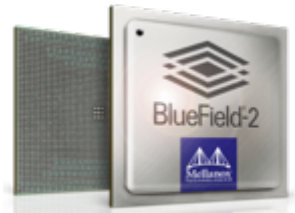
- "Key Management is one of the hardest subjects in security" - Applied Cryptography, Bruce Schneider
- Cryptographic keys are the pillars for secure communication, secure storage, and authentication
  - Break it once, break-it-all
- Cryptographic keys protects data from exposure and modification
- Protecting cryptographic keys is not easy
  - Where do we store a key?
  - What is the lifecycle of a key?
  - When is it most at risk of exposure?

Key Management - Protecting Keys

- Frequency of using the key may produce enough information to decipher the data without knowing the key
  - It's enough to get matching plaintext/ciphertext pair of every word in the English dictionary to decrypt one sentence in English
- Key Managers implemented in software leak data to other applications
  - Side-channels are exploited to leak keys from key mangers
- Single mistake in the implementation of a cryptographic function may result in weak and easy to break cryptography
  - Cryptography fails miserably when deviating from standard guidelines

Key Management

- To reduce the likelihood of exposure, we need to limit who has access to keys and how keys are accessed
  - How is this achieved?
  - Who can we trust to use the keys?
    - Neighbor? Admin? Operating System? System Firmware?
- Guidelines for key management design
  - Apply Trusted Computing principles
    - Trusted hardware
  - Apply privilege separation
  - Apply protection measures against software and hardware attacks
    - E.g. side-channel attacks, software and firmware attacks



Ransomware

- Ransomware is a form of malware that encrypts a victim's files. The attacker then demands a ransom from the victim to restore access to the data upon payment.
- There are a number of vectors ransomware can take to access a computer:
  - phishing spam - most common
  - Exploiting security vulnerabilities
- Everyone is a potential target for a Ransomware attack, from individuals to the largest corporations

Cost of Ransomware

- One of the fastest-growing malware hazards of the 21st century
- Example of Ransomware Attacks:
  - WannaCry in 2017, impacting UK's National Health Service
    - 200,000 computers in over 150 countries
    - Brought hundreds of NHS facilities to a standstill for several days
  - Erie County Medical Center in NY
    - Lost access to 6000 computers, requiring six weeks of manual operations
    - Recovery process that cost US$10M
  - Tech vendor Nuance
    - Attack cost 68M in refunds to customers for service disruptions and another $24M in cleanup costs.
- Total ransoms surged from $325M in 2015 to $5B in 2017, and are projected to reach $11.5B by 2020

Safeguarding against Ransomware

- Ensure that system(s) are kept up-to-date
- Perform frequent backups and verify backups regularly
- Store backups separately. Ideally on devices that aren't network accessible
- Train your organization.
  - Provide regular, mandatory cybersecurity awareness training
  - Implement phishing assessments that simulate real-world phishing emails

Importance of Validating Data Backups

- Data backups can be accidently erased, become corrupted or become invalid for a number of reasons
- Data Backups must to be validated on a regular basis to ensure data integrity and availability
- Data Backup validation provides an extra layer of protection against Ransomware, and ensures that your organization can handle Disaster Recovery

Conclusions

- Cyber-Criminals capabilities are on the rise and attacks are getting stealthier
- Data-at-rest can be easily forgotten and easily accessed when data is not encrypted
- Cryptographic keys are the pillars for protecting data at rest, protecting the keys is a challenge
- Compromised data at rest can be detrimental to organizations as seem in the ransomware examples
- Validating data at rest is a critical component of protecting that data

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- Understanding Storage Security and Threats
- Protecting Data at Rest
- Encryption 101
- Key Management 101 – June 10, 2020
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