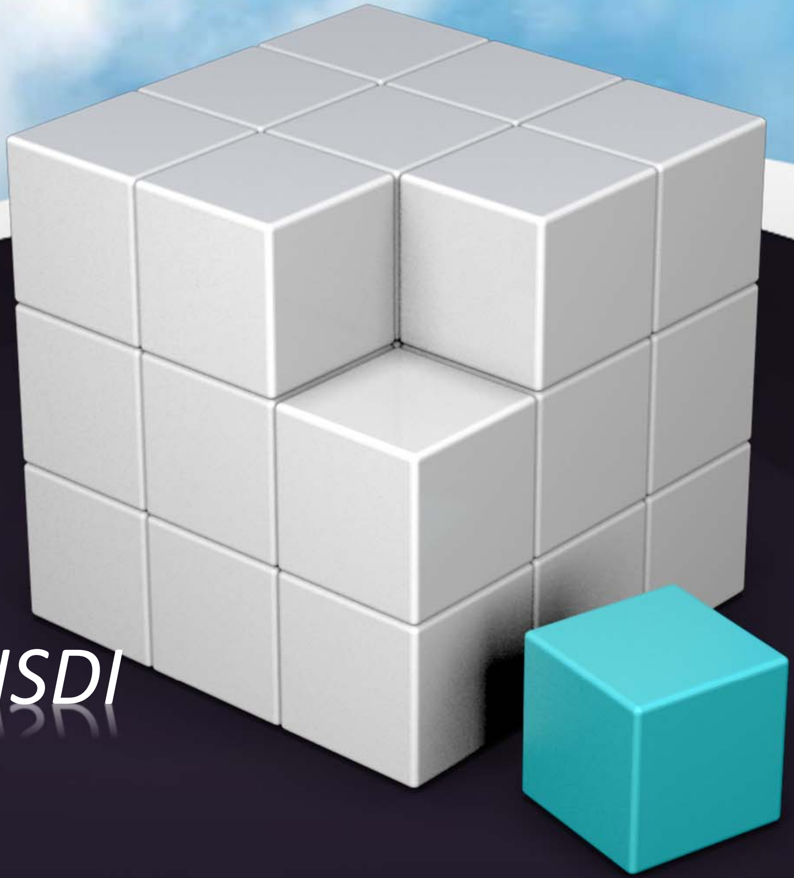
Managing Security in Spatial Data Infrastructure



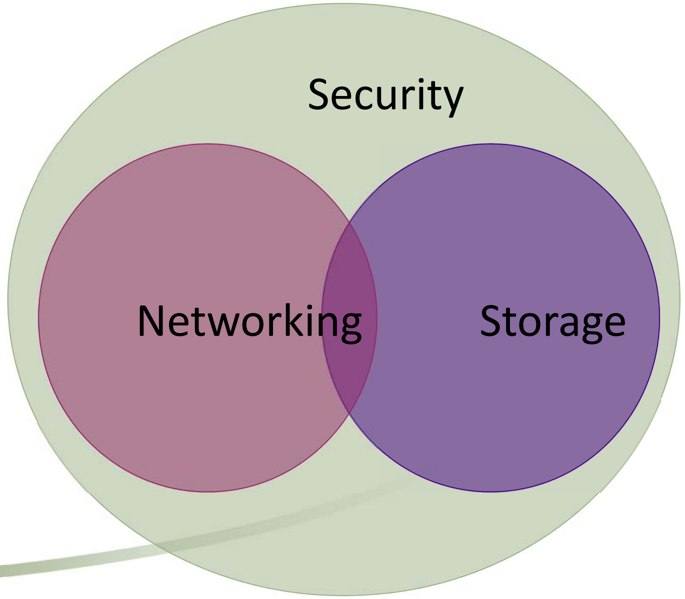
Presented by

R. N. Nanda, SS,NSDI

Dharmendra Singh,SA,NSDI

Information Storage Security

- Application of security principles and practices to storage networking (data storage + networking) technologies
- Focus of storage security: secured access to information
- Storage security begins with building a framework



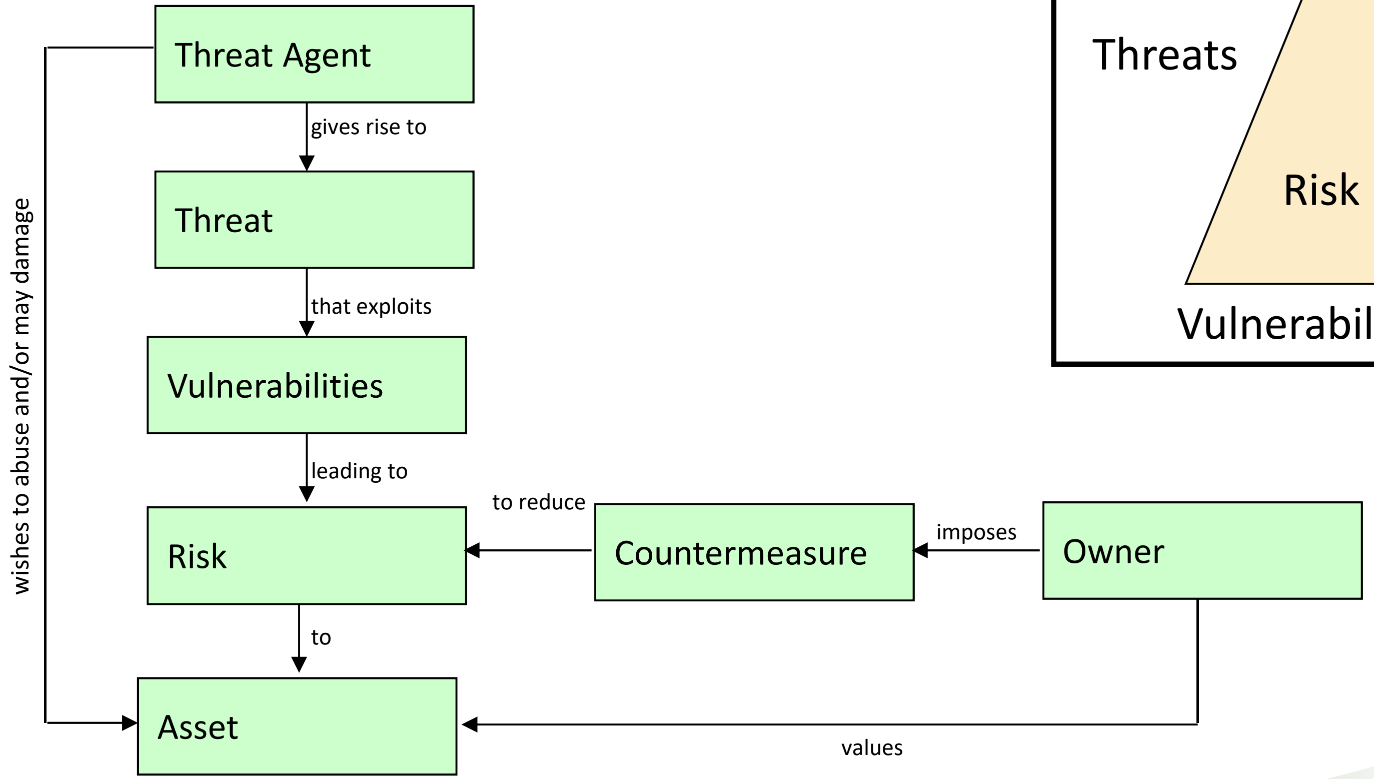
Storage Security Framework

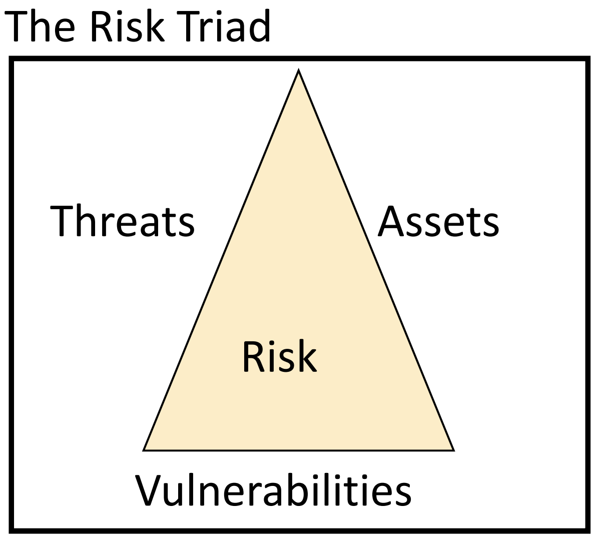
- A systematic way of defining security requirements
- Framework should incorporate:
  - Anticipated security attacks
    - Actions that compromise the security of information
  - Security measures
    - Control designed to protect from these security attacks
- Security framework must ensure:
  - Confidentiality
  - Integrity
  - Availability
  - Accountability

Storage Security Framework: Attribute

- Confidentiality
  - Provides the required secrecy of information
  - Ensures only authorized users have access to data
- Integrity
  - Ensures that the information is unaltered
- Availability
  - Ensures that authorized users have reliable and timely access to data
- Accountability
  - Accounting for all events and operations that takes place in data center infrastructure that can be audited or traced later
  - Helps to uniquely identify the actor that performed an action

Understanding Security Elements





Security Elements: Assets

- "Information" – The most important asset
- Other assets
  - Hardware, software, and network infrastructure
- Protecting assets is the primary concern
- Security mechanism considerations:
  - Must provide easy access to information assets for authorized users
  - Make it very difficult for potential attackers to access and compromise the system
  - Should only cost a small fraction of the value of protected asset
  - Should cost a potential attacker more, in terms of money and time, to compromise the system than the protected data is worth

Security Elements: Threats

- Potential attacks that can be carried out on an IT infrastructure
  - *Passive* attacks
    - Attempts to gain unauthorized access into the system
    - Threats to confidentiality of information
  - *Active* attacks
    - Data modification, Denial of Service (DoS), and repudiation attacks
    - Threats to data integrity and availability

Attack	Confidentiality	Integrity	Availability	Accountability
Access	√			√
Modification	√	√		√
Denial of Service			√	
Repudiation		√		√

Security Elements: Vulnerabilities

- Vulnerabilities can occur anywhere in the system
  - An attacker can bypass controls implemented at a single point in the system
  - Requires “defense in depth” – implementing security controls at each access point of every access path
- Failure anywhere in the system can jeopardize the security of information assets
  - Loss of authentication may jeopardize confidentiality
  - Loss of a device jeopardizes availability

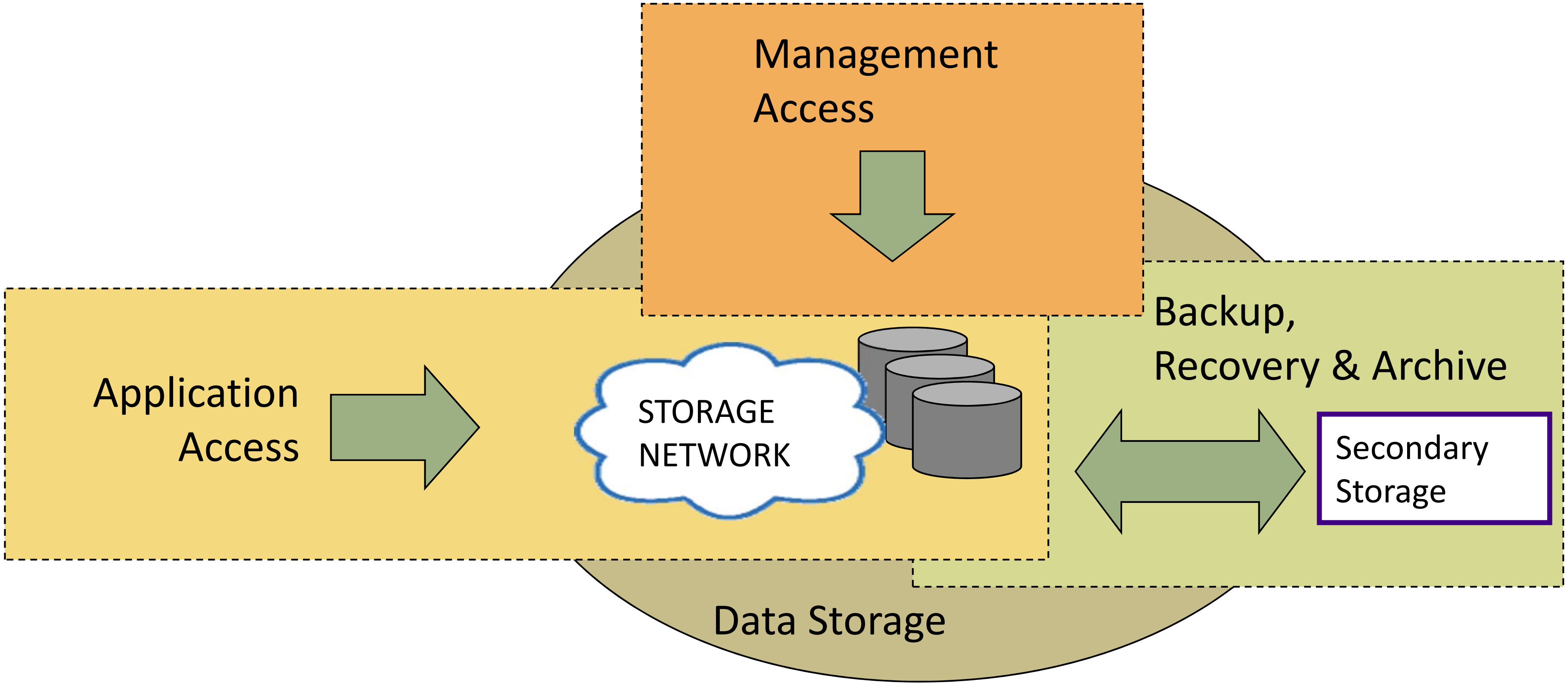
Security Elements: Vulnerabilities (cont.)

- Understanding Vulnerabilities
  - Attack surface
    - Refers to various access points/interfaces that an attacker can use to launch an attack
  - Attack vector
    - A path or means by which an attacker can gain access to a system
  - Work factor
    - Amount of time and effort required to exploit an attack vector
- Solution to protect critical assets:
  - Minimize the attack surface
  - Maximize the work factor
  - Manage vulnerabilities
    - Detect and remove the vulnerabilities, or
    - Install countermeasures to lessen the impact

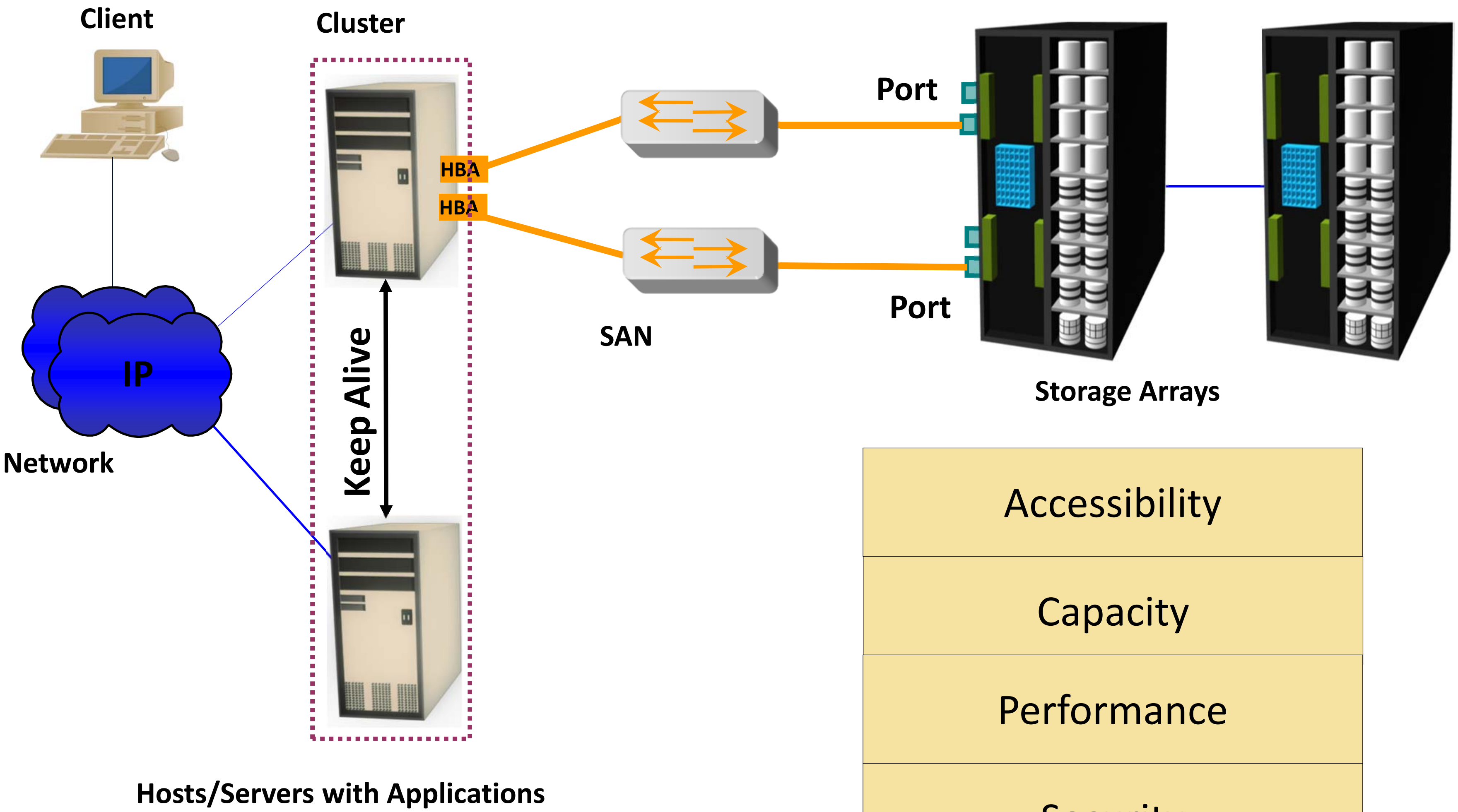
Countermeasures to Vulnerability

- Implement countermeasures (safeguards or controls) in order to lessen the impact of vulnerabilities
- Controls are technical or non-technical
  - Technical
    - implemented in computer hardware, software, or firmware
  - Non-technical
    - Administrative (policies, standards)
    - Physical (guards, gates)
- Controls provide different functions
  - Preventive – prevent an attack
  - Corrective – reduce the effect of an attack
  - Detective – discover attacks and trigger preventive/corrective controls

Storage Security Domains



Monitoring Storage Infrastructure



Accessibility

Capacity

Performance

Security

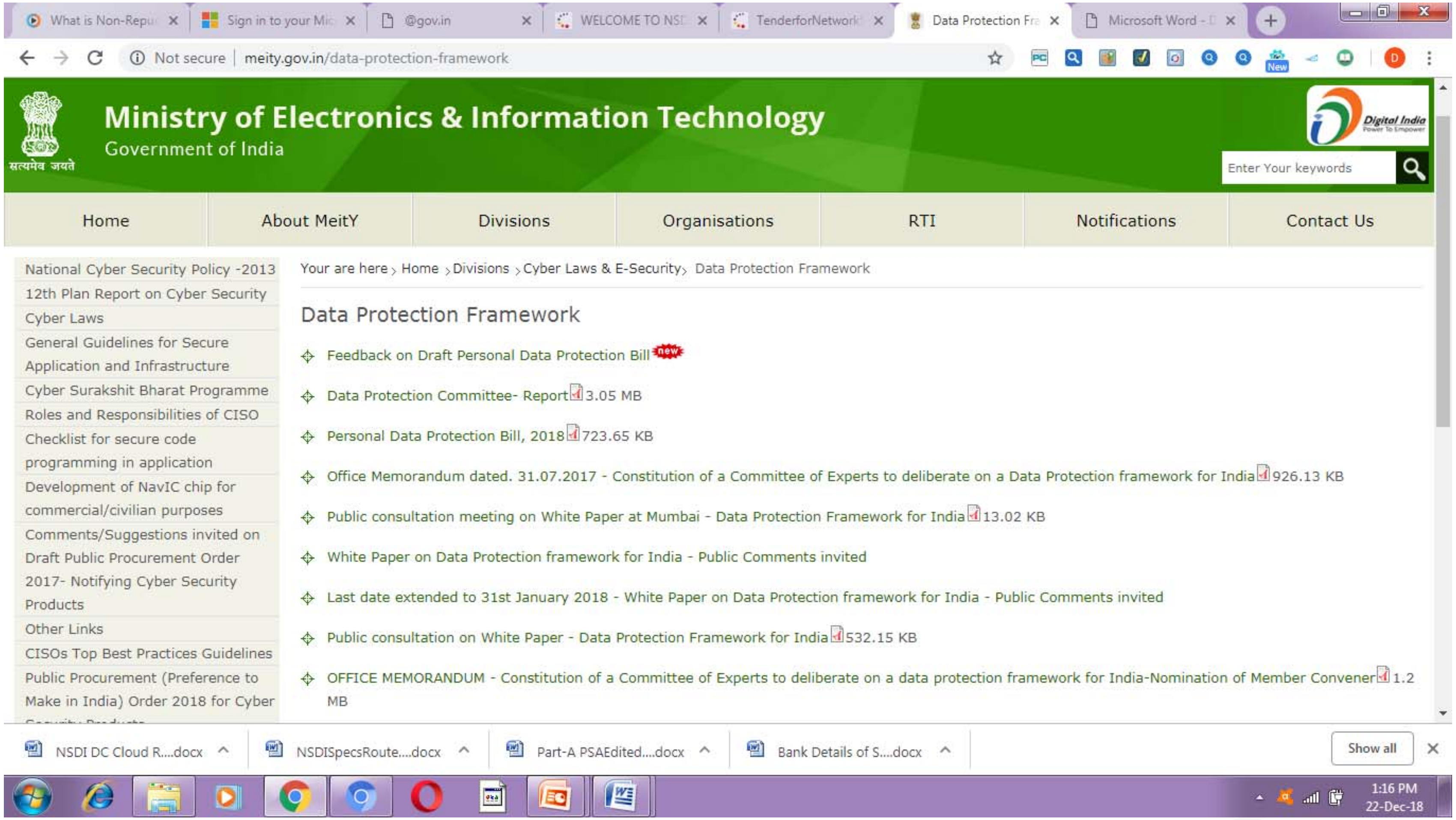
Monitoring Hosts

- Accessibility
  - Hardware components: HBA, NIC, graphic card, internal disk
  - Status of various processes/applications
- Capacity
  - File system utilization
  - Database: Table space/log space utilization
  - User quota
- Performance
  - CPU and memory utilization
  - Transaction response times
- Security
  - Login and authorization
  - Physical security (Data center access)

Storage Infrastructure Management Challenges

- Large number and variety of storage arrays, networks, servers, databases and applications
- Variety of storage devices varying in capacity, performance and protection methodologies
- Deployment of both SAN and IP networks for storage devices
- Servers with different operating systems: UNIX, LINUX, Windows, mainframe
- Interoperability issues between devices from multiple vendors
- Multiple vendor-specific tools to monitor devices from different vendors

Geo Spatial Security in India



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Data Protection Framework

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